

CITY OF
TAMPA, FLORIDA

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS
PROPOSAL, BID BOND, FORM OF NOTICE OF AWARD,
AGREEMENT, PERFORMANCE BOND AND
SPECIFICATIONS

FOR

Contract 20-C-00021

**D.L. Tippin Administration Building
Rehabilitation – Phase 1- Building and Site
Improvements**

City of Tampa
CONTRACT ADMINISTRATION DEPARTMENT
TAMPA MUNICIPAL OFFICE BUILDING
306 E. JACKSON STREET - 4TH FLOOR NORTH
TAMPA, FLORIDA 33602

JUNE 2020

CITY OF TAMPA
CONTRACT ADMINISTRATION DEPARTMENT
306 E. Jackson Street 280A4N
Tampa, FL 33602

BID NOTICE MEMO

Bids will be received no later than 1:30 p.m. on the indicated Date(s) for the following Project(s):

CONTRACT NO.: 20-C-00021; D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements

BID OPENING: 1:30PM, Tuesday, July 14, 2020 **ESTIMATE:** \$ 2,785,000 **SCOPE:** furnishing of all labor, equipment, and material for preserving or restoring certain historic features of an existing structure, selective demolition, cutting and patching, termite control, concrete slab repair, roofing, building insulation, architectural finishes, casework, related mechanical, electrical, fire protection and plumbing work, equipment purchase and installation, any allowances that may be listed in Section 01020, and with all associated work required for a complete project in accordance with the Contract Documents.”

Bids will be opened in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida 33602.

To view the Bid Opening follow these instructions:
To join the meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/173279197>

You can also dial in using your phone. (For supported devices, tap a one-touch number below to join instantly.)
United States: +1 (646) 749-3131 - One-touch: tel:+16467493131,,173279197#

Access Code: 173-279-197

Join from a video-conferencing room or system. Dial in or type: 67.217.95.2 or inroomlink.goto.com
Meeting ID: 173 279 197 Or dial directly: 173279197@67.217.95.2 or 67.217.95.2##173279197

New to GoToMeeting? Get the app now and be ready when your first meeting starts:

<https://global.gotomeeting.com/install/173279197>

In accordance with the Americans with Disabilities Act (“ADA”) and Section 286.26, Florida Statutes, persons with disabilities needing a reasonable accommodation to participate in this public hearing or meeting should contact the City of Tampa’s ADA Coordinator at least 48 hours prior to the proceeding. The ADA Coordinator may be contacted by phone at 813-274-3964, email at TampaADA@tampagov.net, or by submitting an ADA - Accommodations Request online form available at <http://www.tampagov.net/ADARquest>.

Please note that the City of Tampa may not be able to accommodate any request received less than 48 hours before the scheduled public hearing or meeting.

Plans and Specifications and Addenda for this work may be examined at, and downloaded from, www.demandstar.com.
Files are also available at <http://www.tampagov.net/contract-administration/programs/construction-project-bidding>.

Email Questions to: contractadministration@tampagov.net .

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NOTICE TO BIDDERS
CITY OF TAMPA, FLORIDA

Contract 20-C-00021; D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., July 14, 2020, in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida, there to be publicly opened and read aloud.

The proposed work is to include, but not be limited to, ...} furnishing of all labor, equipment, and material for preserving or restoring certain historic features of an existing structure, selective demolition, cutting and patching, termite control, concrete slab repair, roofing, building insulation, architectural finishes, casework, related mechanical, electrical, fire protection and plumbing work, equipment purchase and installation, any allowances that may be listed in Section 01020, and with all associated work required for a complete project in accordance with the Contract Documents.”

The Instructions to Bidders, Proposal, Form of Bid Bond, Agreement, Form of Public Construction Bond, Specifications, Plans and other Contract Documents are posted at DemandStar.com. Backup files may be downloaded from <http://www.tampagov.net/contract-administration/programs/construction-project-bidding>. One set may be available for reference at the office of the Contract Administration Department, Municipal Office Building, Fourth Floor North, City Hall Plaza, Tampa, Florida 33602.

Each Proposal must be submitted on the Proposal form included in the Specifications and must be accompanied by a certified check or cashier's check on a solvent bank or trust company in compliance with Section 255.051, Florida Statutes, made payable to the City of Tampa, in an amount of not less than five per cent of the total bid, or a Bid Bond, of like amount, on the form set forth in the Contract Documents, as a guarantee that, if the Proposal is accepted, the Bidder will execute the Proposed Contract and furnish a Public Construction Bond within twenty (20) days after receipt of Notice of Award of Contract.

To be eligible to submit a proposal, a Bidder must hold the required and/or appropriate current license, certificate, or registration (e.g. DBPR license/certificate of authorization, etc.) in good standing at the time of receipt of Bids. **Per Section 489.131, Florida Statutes, Proposals submitted for the construction, improvement, remodeling, or repair of public projects must be accompanied by evidence that the Bidder holds the required and/or appropriate current certificate or registration, unless the work to be performed is exempt under Section 489.103, Florida Statutes.**

The City of Tampa reserves the right to reject any or all Bids and to waive any informalities in the Bid and/or Bid Bond. Acceptance or rejection of Proposals will be made as soon as practicable after the Proposals are received, but the City reserves the right to hold Proposals for ninety (90) days from the date of Opening.

Bid Protest Procedures: Unless subsequently indicated otherwise, in a revised posting on the Department's web page for Construction Project Bidding, the City of Tampa intends to award the referenced project to the lowest bidder listed in the tabulation posted on or about the date of Bid Opening. A bidder aggrieved by this decision may file a protest not later than 4:30 P.M., five (5) business days from the first posting thereof, pursuant to City of Tampa Code Chapter 2, Article V, Division 3, Section 2-282, Procurement Protest Procedures. Protests not conforming therewith shall not be reviewed.

Pursuant to Section 2-282, City of Tampa Code, during the solicitation period, including any protest and/or appeal, NO CONTACT with City officers or employees is permitted from any bidder or proposer, other than as specifically stated in this solicitation and as follows:
Director of the Contract Administration Department (CAD)
Contracts Management Supervisor, Jim Greiner
Contract Officer, Jody Gray
City legal department

Any Requests For Information must be submitted by email to ContractAdministration@tampagov.net

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.” Refer to Section 287.133, Florida Statutes.

Pursuant to Section 287.087, Florida Statutes, under certain circumstances preference may be given to businesses with a drug-free workplace program that meets the requirements of said Section.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.01 GENERAL:

The proposed work is the D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements in the City of Tampa, as required for a complete project, as shown on the plans and detailed in the specifications. The work is located on land owned or controlled by the City of Tampa.

To be eligible to submit a proposal, a Bidder must hold the required and/or appropriate current license, certificate, or registration (e.g. DBPR license/certificate of authorization, etc.) in good standing at the time of receipt of Bids. **Per Section 489.131, Florida Statutes, Proposals submitted for the construction, improvement, remodeling, or repair of public projects must be accompanied by evidence that the Bidder holds the required and/or appropriate current certificate or registration, unless the work to be performed is exempt under Section 489.103, Florida Statutes.**

I-1.02 FORM PREPARATION AND PRESENTATION OF PROPOSALS: Replace the second sentence with the following: Submission of the entire specification book is not required.

I-1.03 ADDENDA – Section I-2.03 is replaced with the following: No interpretation of the meaning of the Plans, Specifications, or other Contract Documents will be made to any Bidder orally.

Every request for such interpretation must be in writing, addressed to the City of Tampa, Contract Administration Department, 306 E. Jackson St., 4th Floor, Tampa, Florida 33602 and then emailed to ContractAdministration@tampagov.net. To be given consideration, such request must be received at least seven (7) days prior to the date fixed for the opening of the Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be posted on DemandStar.Com and on the Department's web page. Failure of any Bidder to receive any such addenda shall not relieve said Bidder from any obligation under his Proposal as submitted. All addenda so issued shall become part of the Contract Documents.

I-1.04 INSTRUCTIONS TO BIDDERS

SECTION 2 – GENERAL INSTRUCTIONS. Section I-2.07 SIGNATURE AND QUALIFICATIONS OF BIDDERS is replaced with the following:

Proposals must be signed in ink by the Bidder with signature in full. When firm is a Bidder, the Proposal shall be signed in the name of the firm by one or more partners. When a corporation is a bidder the officer signing shall set out the corporate name in full beneath which he shall sign his name and give the title of his office.

If the bidder referred to in Section I-2.07 is a corporation, it must submit; upon request, a copy of its filed Articles of Incorporation. In addition, if the bidder was incorporated in another state, it must establish that it is authorized to do business in the State of Florida. If the bidder is using a fictitious name, it must submit upon request, proof of registration of such name with the Clerk of the Circuit Court of the County where its principal place of business is. Failure to submit what is required is grounds to reject the bid of that bidder.

SECTION 2 – GENERAL INSTRUCTIONS. Section I-2.14 NONDISCRIMINATION IN EMPLOYMENT is changed to add the following to the end of the existing text:

The following provisions are hereby incorporated into any contract executed by or on behalf of the City. Contractor shall comply with the following Statement of Assurance: During the performance of the Contract, the Contractor assures the City, that the Contractor is in compliance with Title VII of the 1964 Civil Rights Act, as amended, the Florida Civil Rights Act of 1992, and the City of Tampa Code of Ordinances, Chapter 12, in that Firm/Contractor does not on the grounds of race, color, national origin, religion, sex, sexual orientation, gender identity or expression, age, disability, familial status, or marital status, discriminate in any form or manner against said Firm's/Contractor's employees or applicants for employment. Contractor understands and agrees that the Contract is conditioned upon the veracity of this Statement of Assurance, and that violation of this condition shall be considered a material breach of the Award/Contract. Furthermore, Contractor herein assures the City that said Contractor will comply with Title VI of the Civil Rights Act of 1964 when federal grant(s) is/are

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

involved. This Statement of Assurance shall be interpreted to include Vietnam-Era Veterans and Disabled Veterans within its protective range of applicability. Firm/Contractor further acknowledges and agrees to provide the City with all information and documentation that may be requested by the City from time to time regarding the solicitation, selection, treatment and payment of subcontractors, suppliers and vendors in connection with this Award/Contract. Firm/Contractor further acknowledges that it must comply with City of Tampa Code of Ordinances, Chapter 26.5, as enacted by Ordinance No. 2008-89.

I-1.05 TIME FOR COMPLETION:

The work shall be arranged to be completed in accordance with a progress schedule approved by the Construction Engineer.

The time for completion of this project, referred in Article 4.01 of the Agreement, shall be 210 consecutive calendar days. The period for performance shall start from the date indicated in the Notice To Proceed.

I-1.06 LIQUIDATED DAMAGES:

The amount of liquidated damages, referred to in Article 4.06 of the Agreement, for completion of this project shall be \$500 per calendar day.

I-1.07 BASIS OF AWARD OF CONTRACT:

The basis of award referred to in Item I-2.11 of Instructions to Bidders shall be the greatest amount of work, which can be accomplished within the funds available as budgeted. The award may be made on the basis of the total bid, base bid, alternates(s) if any, unit bids if any, or any combination thereof deemed to be in the best interest of the City.

Unless all bids are rejected, the award will be made within 90 days after opening proposals.

I-1.08 GROUND BREAKING CEREMONY:

Arrangement may be made by the City in coordination with the Contractor, for construction to commence with a Ground Breaking Ceremony. Details will be discussed at the pre-construction conference.

I-1.09 INSURANCE:

The insurance required for this project shall be as indicated on the attached and incorporated Special Instructions pages beginning with page INS-1 entitled CITY OF TAMPA INSURANCE REQUIREMENTS, which among other things requires the Contractor to provide a Certificate of Insurance to the City prior to commencing work. The City may from time to time use a third party vendor to manage its insurance certificates and related documentation which vendor may periodically initiate contact, requests for information, etc. on the City's behalf.

INSTRUCTIONS TO BIDDERS
SECTION 1 – SPECIAL INSTRUCTIONS

I-1.10 EQUAL BUSINESS OPPORTUNITY PROGRAM (EBO) REQUIREMENTS / PROJECT SUBCONTRACTING GOAL(S)

BIDDERS MUST SUBMIT COMPLETED AND SIGNED CITY OF TAMPA FORMS MBD-10 AND MBD-20 WITH THEIR BIDS. BIDS SUBMITTED WITHOUT THESE COMPLETED FORMS (INCLUDING SIGNATURES) WILL BE DEEMED NON-RESPONSIVE. INSTRUCTIONS ON COMPLETING THE FORMS ARE INCLUDED AFTER EACH FORM IN THIS BID PACKAGE.

THE CHECKED BOX INDICATES SECTION THAT APPLIES TO THIS BID.



SUBCONTRACTING GOAL – (WMBE and SLBE)

In accordance with the City of Tampa's EBO Program, Chapter 26.5, City of Tampa Code, the subcontracting goal(s) has/have been established for subcontracting with City-certified underutilized WMBEs (Women and Minority Business Enterprises) and/or SLBEs (Small Local Business Enterprises) on this project (hereinafter "Goal"). *The Goal is based, in part, upon the availability of City-certified firms to perform the anticipated scope of work (Bid is subject to the subcontracting project goal(s) section for which a corresponding numerical percent is indicated).* Project Industry Category: Construction

- Project Goal(s): **24% U-WMBE (Underutilized Woman and Minority Business Enterprise) (EBO Program)**
per MBD Form-70 the U-WMBE subcontract Classification for Construction is African American (BBE)
 % SLBE (Small Local Business Enterprise) (EBO Program) only City-certified SLBEs
 % U-WMBE/SLBE Combined (EBO Program)
per MBD Form-70 the U-WMBE subcontract Classification for Construction is African American (BBE) together with City-certified SLBEs
 % WMBE/SLBE ASPIRATIONAL (EBO Program) An all-inclusive SLBE/WMBE goal; any City certified firm counts towards goal attainment.

BIDDERS MUST SOLICIT ALL COMPANIES ON THE ATTACHED AVAILABILITY CONTACT LIST at least **five (5) City business days or more prior to bid opening as a first step** to demonstrate Good Faith Efforts to achieve the Goal. Substantive documentation that demonstrates Good Faith Efforts to achieve the Goal **must be submitted with the bid**, including emails, faxes, phone calls, letters, and other communication with City-certified firms. Bidders may explore other potential opportunities for subcontracting by consulting the current directory of all certified firms posted by the City of Tampa at <https://tampa.diversitysoftware.com> as the Availability Contact List may not be inclusive of all firms that could count toward Goal attainment. However, ONLY SUBCONTRACTING with those specific WMBEs designated as "underutilized" by Classification in the appropriate industry category (and, if made applicable by being specifically included in the above Goal, SLBEs) will count toward meeting the Goal. Making Good Faith Efforts through these and other means (not pro-forma) is the responsibility of the Bidder. See the attached Good Faith Effort Compliance Plan (GFCEP) (MBD Form-50) for specific requirements.

GOOD FAITH EFFORT COMPLIANCE PLAN (GFCEP) REQUIRED (MBD FORM-50). When a Goal has been established, the Bidder **must submit** with its bid a Good Faith Effort Compliance Plan (GFCEP) using the attached MBD Form-50 together with supporting documentation as specified therein. **Submittals that do not contain MBD Form-50 when a Goal has been established will be deemed non-responsive.** Additional explanation and documentation is required whenever a City-certified subcontractor's quote is not utilized. Any additional information regarding GFCEP (post-bid) shall be only upon the City's request for clarification of information submitted with bid and not to "cure" omissions or deficiencies of the bid.

NOTE: When U-WMBEs are included in a Goal, only those City-certified subcontractors whose WMBE Classification is designated "underutilized" will count toward Goal attainment. Refer to **MBD Form-70** to identify underutilized WMBEs by subcontract Classification for the applicable project industry category. A prime bidder who is a City-certified WMBE and/or SLBE is not exempt from the **GFCEP MBD Form-50** requirements.



SUBCONTRACTING GOAL – (DBE) FDOT DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

The City of Tampa is required to use the Florida Department of Transportation (FDOT) Disadvantaged Business Enterprise (DBE) program on contracts with Federal Highway Administration (FHWA) funds. Effective October 1, 2017 through to September 30, 2020, the overall FDOT DBE aspirational goal is **10.65%** and is *race neutral*, meaning that FDOT believes the aspirational DBE goal may be achieved entirely through ordinary, competitive procurement methods. Despite the absence of a contract specific DBE goal on this project, the City encourages bidders to seek out and use DBEs and other minority, small businesses. For assistance in identifying certified DBEs, FDOT offers the use of its supportive services program accessed via FDOT's Equal Opportunity Office at <http://www.fdot.gov/equalopportunity/serviceproviders.shtm>. FDOT DBE rules and regulations apply to this solicitation, including the requirement to report bidder opportunity information in the FDOT Equal Opportunity Compliance (EOC) web-based application within three (3) business days of submission of the bid for ALL subcontractors who quoted bidder for this specific project. The five (5) char/digit LAP Agreement Contract Number for this project is G _____. The web address to the EOC system is: <https://fdotwp1.dot.state.fl.us/EqualOpportunityCompliance/Account.aspx/LogIn?ReturnUrl=%2fEqualOpportunityCompliance>

NOTE: Regardless of FDOT DBE program applicability, for data collection purposes bidder still **must submit** City Forms MBD-10 and MBD-20 completed and signed with its bid or the bid will be deemed non-responsive.

DIVERSITY MANAGEMENT INITIATIVE (DMI) DATA REPORTING FORMS REQUIRED FOR ALL CONTRACTS

Bidder **must submit**, with its bid, completed and signed Forms MBD-10 and MBD-20 to be considered a responsive bid. Specifically, the 'Schedule of All Solicited Sub-(Contractors/Consultants/Suppliers) (Form MBD-10)' listing all subcontractors (including non-certified) solicited and 'Schedule of All -To Be Utilized Sub-(Contractors/Consultants/Suppliers) (Form MBD-20)' listing all subcontractors (including non-certified) to be utilized. Supplemental forms, such as 'Form MBD-40 Official Letter Of Intent' (LOI), can be submitted with the bid or once declared lowest-responsive bidder. After an award, 'DMI Sub-(Contractors/Consultants/Suppliers) Payment Form (Form MBD-30)' is to be submitted with payment requests to report payments to subcontractors and using the on-line automated MBD compliance software system available at <https://tampa.diversitysoftware.com>

For additional information about the WMBE and SLBE programs contact the Minority and Small Business Development Office at 813-274-5522. (3-18)

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.11 BID SECURITY:

Surety companies shall have a rating of not less than B+ Class VI as evaluated in the most recently circulated Best KeyRating Guide Property/Casualty.

I-1.12 PUBLIC CONSTRUCTION BOND:

The Bidder who is awarded the Contract will be required to furnish a Public Construction Bond upon the form provided herein, equal to 100 percent of the Contract price, such Bond to be issued and executed by (a) surety company(ies) acceptable to the City and licensed to underwrite contracts in the State of Florida. After execution of the Agreement and before commencing work, the Contractor must provide the City a certified copy of the officially recorded Bond.

I-1.13 AGREEMENT

SECTION 2 – POWERS OF THE CITY’S REPRESENTATIVES, new Article 2.05:

Add the following:

Article 2.05 CITY’S TERMINATION FOR CONVENIENCE:

The City may, at any time, terminate the Contract in whole or in part for the City’s convenience and without cause. Termination by the City under this Article shall be by a notice of termination delivered to the Contractor, specify the extent of termination and the effective date.

Upon receipt of a notice of termination, the Contractor shall immediately, in accordance with instructions from the City, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

- (a) cease operations as specified in the notice;
- (b) place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;
- (c) terminate all subcontracts and orders to the extent they relate to the Work terminated;
- (d) proceed to complete the performance of Work not terminated; and
- (e) take actions that may be necessary, or that the City may direct, for the protection and preservation of the terminated Work.

The amount to be paid to the Contractor by the City because of the termination shall consist of:

- (a) for costs related to work performed on the terminated portion of the Work prior to the effective date including termination costs relative to subcontracts that are properly chargeable to the terminated portion of the Work;
- (b) the reasonable costs of settlement of the Work terminated, including accounting, legal, clerical and other expenses reasonable necessary for the preparation of termination settlement proposals and supporting data; additional costs of termination and settlement of subcontracts excluding amounts of such settlements; and storage, transportation, and other costs incurred which are reasonably necessary for the preservation, protection or disposition of the terminated Work; and
- (c) a fair and reasonable profit on the completed Work unless the Contractor would have sustained a loss on the entire Contract had it been completed.

Allowance shall be made for payments previously made to the Contractor for the terminated portion of the Work, and claims which the City has against the Contractor under the Contract, and for the value of materials supplies, equipment or other items that are part of the costs of the Work to be disposed of by the Contractor.

SECTION 5 – SUBCONTRACTS AND ASSIGNMENTS, Article 5.01, Page A-7, last paragraph:

Change “...twenty-five (25) percent...” to “...fifty-one (51) percent...”

SECTION 8 – CONTRACTOR’S EMPLOYEES, Article 8.03, Page A-9, delete Article 8.03 in its entirety and

Replace with the following new article:

ARTICLE 8.03 EMPLOYMENT OPPORTUNITIES

The Contractor shall, in the performance of the work required to be done under this Contract, employ all workers without discrimination and must not maintain, provide or permit facilities that are segregated.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

SECTION 10 – PAYMENTS, Article 10.05, Page A-10, 1st Paragraph, 1st Sentence:

Change "...fair value of the work done, and may apply for..." to "...fair value of the work done, and shall apply for..."

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.02, Page A-12, 1st Paragraph, 2nd Sentence:

Delete the 2nd Sentence in its entirety and replace it with the following new 2nd Sentence:

Without limiting application of Article 11.07, below, whenever the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall indemnify, defend, and hold harmless the City Indemnified Parties (as defined below) from any and all Claims (as defined below) for infringement by reason of the use of any such patented design, device, tool, material, equipment, or process, to be performed under the Contract and damages which may be incurred by reason of such infringement at any time during the prosecution or after completion of the work.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.03, Page A-12:

Delete Article 11.03 in its entirety and replace with the following new article:

ARTICLE 11.03 INTENTIONALLY OMITTED.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.07, Page A-12:

Delete Article 11.07 in its entirety and replace with the following new article:

ARTICLE 11.07 INDEMNIFICATION PROVISIONS

Whenever there appears in this Agreement, or in the other Contact Documents made a part hereof, an indemnification provision within the purview of Chapter 725.06, Laws of Florida, the monetary limitation on the extent of the indemnification under each such provision shall be One Million Dollars or a sum equal to the total Contract price, whichever shall be the greater.

Contractor releases and agrees to defend, indemnify and hold harmless the City, its officers, elected and appointed officials, employees, and/or agents (collectively, "City Indemnified Parties") from and against any and all losses, liabilities, damages, penalties, settlements, judgments, charges, or costs (including without limitation attorneys' fees, professional fees, or other expenses) of every kind and character arising out of any and all claims, liens, is entitled to indemnification hereunder. This obligation shall in no way be limited in any nature whatsoever by any limitation on the amount or type of Contractor's insurance coverage.

The parties agree that to the extent the written terms of this indemnification are deemed by a court of competent jurisdiction to be in conflict with any provisions of Florida law, in particular Sections 725.06 and 725.08, Florida Statutes, the written terms of this indemnification shall be deemed by any court of competent jurisdiction to be modified in such a manner as to be in fully and complete compliance with all such laws and to contain such limiting conditions or limitations of liability, or to not contain any unenforceable or prohibited term or terms, such that this indemnification shall be enforceable in accordance with and to the maximum extent permitted by Florida law.

The obligation of Contractor under this Article is absolute and unconditional; it is not conditioned in any way on any attempt by a City Indemnified Party to collect from an insurer any amount under a liability insurance policy, and is not subject to any set-off, defense, deduction, or counterclaim that the Contractor might have against the City Indemnified Party. The duty to defend hereunder is independent and separate from the duty to indemnify, and the duty to defend exists regardless of any ultimate liability of Contractor, the City, and any City Indemnified Party. The duty to defend arises immediately upon presentation of a Claim by any party and written notice of such Claim being provided to Contractor. Contractor's defense and indemnity obligations hereunder will survive the expiration or earlier termination of this Contract.

Contractor agrees and recognizes that the City Indemnified Parties shall not be held liable or responsible for any Claims which may result from any actions or omissions of Contractor in which the City Indemnified Parties participated either through providing data or advice and/or review or concurrence of Contractor's actions. In

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

reviewing, approving or rejecting any submissions by Contractor or other acts of Contractor, the City in no way assumes or shares any responsibility or liability of Contractor or any tier of subcontractor/subconsultant/supplier, under this Contract.

In the event the law is construed to require a specific consideration for such indemnification, the parties agree that the sum of Ten Dollars and 00/100 (\$10.00), receipt of which is hereby acknowledged, is the specific consideration for such indemnification and the providing of such indemnification is deemed to be part of the specifications with respect to the services provided by Contractor.

SECTION 11 – MISCELLANEOUS PROVISIONS, Article 11.12, Page A-13:
Change Article 11.12 to add the following new language after existing text:

The City of Tampa is a public agency subject to Chapter 119, Florida Statutes. In accordance with Florida Statutes, 119.0701, Contractor agrees to comply with Florida’s Public Records Law, including the following:

1. Contractor shall keep and maintain public records required by the City to perform the services under this Agreement;
2. Upon request by the City, provide the City with copies of the requested records, having redacted records in total on in part that are exempt from disclosure by law or allow the records to be inspected or copied within a reasonable time (with provision of a copy of such records to the City) on the same terms and conditions that the City would provide the records and at a cost that does not exceed that provided in Chapter 119, Florida Statutes, or as otherwise provided by law;
3. Ensure that records, in part or in total, that are exempt or that are confidential and exempt from disclosure requirements are not disclosed except as authorized by law for the duration of the Agreement term and following completion (or earlier termination) of the Agreement if Contractor does not transfer the records to the City;
4. Upon completion (or earlier termination) of the Agreement, Contractor shall within 30 days after such event either transfer to the City, at no cost, all public records in possession of the Contractor or keep and maintain the public records in compliance with Chapter 119, Florida Statutes. If Contractor transfers all public records to the City upon completion (or earlier termination) of the Agreement, Contractor shall destroy any duplicate records that are exempt or confidential and exempt from public records disclosure requirements. If Contractor keeps and maintains public records upon completion (or earlier termination) of the Agreement, Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City in a format that is compatible with the information technology systems of the agency.

The failure of Contractor to comply with Chapter 119, Florida Statutes, and/or the provisions set forth in this Article shall be grounds for immediate unilateral termination of the Agreement by the City; the City shall also have the option to withhold compensation due Contractor until records are received as provided herein.

IF CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT 813-274-8598, JIM.GREINER@TAMPAGOV.NET, AND CONTRACT ADMINISTRATION DEPARTMENT, TAMPA MUNICIPAL OFFICE BUILDING, 4TH FLOOR, 306 E. JACKSON ST. TAMPA, FLORIDA 33602.

I-1.14 Contractors must utilize the U.S. Department of Homeland Security’s E-Verify Systems to verify the employment eligibility of all persons employed during the term of the Contract to perform employment duties within the State of Florida and all persons, including subcontractors, assigned by Contractor to perform work pursuant to the contract.

INSTRUCTIONS TO BIDDERS
SECTION 1 - SPECIAL INSTRUCTIONS

I-1.15 GENERAL PROVISIONS; G-2.02 Copies Furnished to Contractor: Replace the first paragraph with the following:

The Contractor shall acquire for its use copies of the plans and specifications as needed, which may be downloaded from the City's web site, at <http://www.tampagov.net/contract-administration/programs/construction-project-bidding>.

Bidder as part of the solicitation process (and as Contractor if Bidder is successful) may hold, come into possession of, and/or generate certain building plans, blueprints, schematic drawings, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, facility, or other structure owned or operated by the City or an agency (singularly or collectively "Exempt Plans"), which pursuant to Section 119.071(3), Florida Statutes, are exempt from Section 119.07(1), Florida Statutes and Section 24(a), Art. I of the Florida State Constitution. Contractor certifies it has read and is familiar the exemptions and obligations of Section 119.071(3), Florida Statutes; further that Contractor is and shall remain in compliance with same, including without limitation maintaining the exempt status of such Exempt Plans, for so long as any Exempt Plans are held by or otherwise in its possession.

I-1.16 PAYMENT DISPUTE RESOLUTION

Any dispute pertaining to pay requests must be presented to the City pursuant to Executive Order 2003-1.

I-1.17 SCRUTINIZED COMPANIES CERTIFICATION

Section 287.135, Florida Statutes, prohibits agencies or local governmental entities from contracting for goods or services of any amount with companies that are on the Scrutinized Companies that Boycott Israel List or are engaged in a boycott of Israel, and of \$1 million or more with companies that are on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or are engaged in business operations in Cuba or Syria. Specifically, Section 287.135(2), Florida Statutes, states: "A company is ineligible to, and may not, bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services of: (a) Any amount if, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company is on the Scrutinized Companies that Boycott Israel List, created pursuant to s. 215.4725, or is engaged in a boycott of Israel; or (b) One million dollars or more if, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company: 1. Is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to s. 215.473; or 2. Is engaged in business operations in Cuba or Syria."

Upon submitting its bid or proposal, a bidder/proposer: (i) certifies the company is not in violation of Section 287.135, Florida Statutes, and shall not be in violation at the time the company enters into or renews any resulting contract; and (ii) agrees any such resulting contract shall be deemed to contain a provision that allows the City, at its option, to terminate such contract for cause if the company is found to have submitted a false certification, been placed on one or any of the foregoing Lists, been engaged in a boycott of Israel, or been engaged in business operations in Cuba or Syria.

I-1.18 FLORIDA'S PUBLIC RECORDS LAW; DATA COLLECTION

Pursuant to Section 119.071(5)(a)2a, Florida Statutes, social security numbers shall only be collected from Bidders and/or Contractor by the City should such number be needed for identification, verification, and/or tax reporting purposes. To the extent Bidder and/or Contractor collects an individual's social security number in the course of acting on behalf of the City pursuant to the terms and conditions of its Proposal or, if awarded, the Agreement, Bidder and/or Contractor shall follow the requirements of Florida's Public Records Law.

INSTRUCTIONS TO BIDDERS

SECTION 2 GENERAL INSTRUCTIONS

I-2.01 BIDDER'S RESPONSIBILITY

Before submitting Proposals, Bidders shall carefully examine the entire site of the proposed work and adjacent premises and the various means of approach and access to the site, and make all necessary investigations to inform themselves thoroughly as to the facilities necessary for delivering, placing and operating the necessary construction equipment, and for delivering and handling materials at the site, and inform themselves thoroughly as to all difficulties involved in the completion of all the work in accordance with the Contract Documents.

Bidders must examine the Plans, Specifications, and other Contract Documents and shall exercise their own judgment as to the nature and amount of the whole of the work to be done, and for the bid prices must assume all risk of variance, by whomsoever made, in any computation or statement of amounts or quantities necessary to complete the work in strict compliance with the Contract Documents.

Elevations of the ground are shown on the Plans and are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation. Bidders shall satisfy themselves as to the correctness of all elevations.

The City may have acquired, for its own use, certain information relating to the character of materials, earth formations, probable profiles of the ground, conditions below ground, and water surfaces to be encountered at the site of the proposed work. This information, if it exists, is on file at the offices of the Department of Public Works and Bidders will be permitted to see and examine this information for whatever value they consider it worth. However, this information is not guaranteed, and Bidders should satisfy themselves by making borings or test pits, or by such other methods as they may prefer, as to the character, location, and amounts of water, peat, clay, sand, quicksand, gravel, boulders, conglomerate, rock, gas or other material to be encountered or work to be performed.

Various underground and overhead structures and utilities are shown on the plans. The location and dimensions of such structures and utilities, where given, are believed to be reasonably correct, but do not purport to be absolutely so. These structures and utilities are plotted on the Plans for the information of the Bidders, but information so given is not to be construed as a representation or assurance that such structures will be found or encountered as plotted, or that such information is complete or accurate.

I-2.02 FORM, PREPARATION AND PRESENTATION OF PROPOSALS

Each Proposal shall be submitted upon the Proposal Form and in accordance with the instructions included herein. The Proposal Form must not be detached herefrom. All blank spaces for bid prices must be filled in, in both words and figures, with the unit or lump sum prices, or both, for which the Proposal is made. The computed total price for each unit price Contract Item shall be determined by multiplying the estimated quantity of the item, as set forth in the Proposal Form, by the corresponding unit price bid for such item. The resulting product shall be entered in the appropriate blank space under the column headed "Computed Total Price for Item". The lump sum price bid for each lump sum price Contract Item shall also be entered in the column headed "Computed Total Price for Item". If a Proposal contains any omissions, erasures, alterations, additions, or items not called for in the itemized Proposal, or contains irregularities of any kind, such may constitute sufficient cause for rejection of the Proposal. In case of any discrepancy in the unit price or amount bid for any item in the Proposal, the price as expressed in written words will govern. In no case is the Agreement Form to be filled out or signed by the Bidder.

In the case of certain jobs bid Lump Sum a "Schedule of Unit Prices" must be filled out as an attachment to the Lump Sum proposal. These prices may be used as a guide for the negotiation of change orders, at the City's option.

The proposal must be signed and certified and be presented on the prescribed form in a sealed envelope on/or before the time and at the place stated in the Notice of Bidders, endorsed with the name of the person, firm or corporation presenting it, the date of presentation, and the title of the work for which the Proposal is made.

Unless the apparent low bidder is now engaged in or has recently completed contract work for the City of Tampa, he, if requested, shall furnish to the City, after the opening of bids and prior to award, a summary statement of record of construction experience over the past three (3) years with proper supporting evidence, and, if required by the City, shall also furnish a list of equipment and other facilities pertinent to and available for the proper execution of the proposed work, and a statement of financial resources to the extent necessary to establish ability to carry on the proposed work. The City may make further investigations as considered necessary with respect to responsibility of the Bidder to whom it appears may be awarded the Contract.

If forwarded by mail, the sealed envelope containing the Proposal, endorsed as directed above, must be enclosed in another envelope addressed as specified in the Notice to Bidders and sent by registered mail.

I-2.03 ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Plans, Specifications, or other Contract Documents will be made to any Bidder orally.

Every request for such interpretation must be in writing, addressed to the Contract Administration Department, Tampa Municipal Office Building, 4th Floor North, City Hall Plaza, Tampa, Florida 33602. To be given consideration, such request must be received at least seven (7) days prior to the date fixed for the opening of the Proposals. Any and all such interpretations and any supplemental instructions will be in the form of written addenda which, if issued, will be sent by certified mail, with return receipt requested, to all prospective bidders at the respective addresses furnished, for such purposes, not later than three (3) working days prior to the date fixed for the opening of the Proposals, and if requested, a copy will be delivered to the prospective bidder's representative. Failure of any Bidder to receive any such addenda shall not relieve said Bidder from any obligation under his Proposal as submitted. All addenda so issued shall become part of the Contract Documents.

I-2.04 BID SECURITY

Each Proposal must be accompanied by a certified or cashier's check issued by a solvent bank or trust company and payable at sight to the City of Tampa, in compliance with Section 255.051 Florida Statutes, or a Bid Bond upon the form provided herein, in an amount of not less than five percent of the sum of the computed total amount of the Bidder's Proposal as a guarantee that if the Proposal is accepted, the Bidder will execute and fill in the proposed Contract and Public Construction Bond within twenty (20) days after notice of award of the Contract. Certified checks shall have all necessary documentary revenue stamps attached if required by law. Surety on Bid Bonds shall be a duly authorized surety company authorized to do business in the State of Florida, and all such Bonds shall be issued or countersigned by a local resident producing agent, and satisfactory evidence of the authority of the person or persons executing such Bond to Execute the same shall be submitted with the Bond. Bid Bonds shall be issued by a surety company acceptable to the City.

Within ten (10) days after the opening of Proposals, the bid security of all but the three lowest Bidders will be returned. The bid security of the remaining two Bidders whose Proposals are not accepted will be

returned within ten (10) days after the execution of the Contract, or, if no such Contract has been executed, within ninety (90) days after the date of opening Proposals. The bid security of the Bidder whose Proposal is accepted will be returned only after he has duly executed the Contract and furnished the required Public Construction Bond and insurance.

Should it be necessary for the City to retain the bid security and said bid security is in the form of checks, the checks of these Bidders will be returned if replaced by Bid Bonds in an amount equal to the amount of the checks of such Bidders in such form and issued by a surety company acceptable to the City.

A Bidder may withdraw his Proposal before the time fixed for the opening of Proposals, without prejudice to himself, by communicating his purpose, in writing, to the Mayor and City Council, and when his communication is received, the Proposal will be handed to him or his authorized agent unopened. No Bidder may withdraw his Proposal within ninety (90) days after the day of opening Proposals.

The Bidder whose Proposal is accepted shall enter into a written contract, upon the Agreement form included herein, for the performance of the work and furnish the required Public Construction Bond within twenty (20) days after written notice by the City of Award of Contract has been served on such Bidder personally or after receipt of the written notice by registered mail to such Bidder at the address given in his Proposal.

If the Bidder to whom a Contract is awarded refuses or neglects to execute it or fails to furnish the required Public Construction Bond within twenty (20) days after receipt by him of the Notice of Award of Contract, the amount of his bid security shall be forfeited and shall be retained by the City as liquidated damages, and not as a penalty, it being now agreed that said sum is a fair estimate of the amount of damages that the City will sustain in case said Bidder fails to enter into a Contract and furnish the required Public Construction Bond. If a Bid Bond was furnished, the full amount of the Bond shall become due and payable as liquidated damages caused by such failure. The full amount of the bid security shall be forfeited as liquidated damages without consideration of the fact that an award may be less than the full amount of the Bidder's Proposal, excepting that the award shall be within the conditions of said Proposal relating to the basis of consideration for an award. No plea of mistake in the bid or misunderstanding of the conditions of forfeiture shall be available to the Bidder for the recovery of his deposit or as a defense to any action based upon the neglect or refusal to execute a contract.

I-2.05 LAWS AND REGULATIONS

The Bidder who is awarded the Contract must comply with all laws of the State of Florida, and all applicable Ordinances of the City of Tampa respecting labor and compensation and with all other statutes, ordinances, rules and regulations applicable and having the force of law.

I-2.06 PUBLIC CONSTRUCTION BOND

The Bidder who is awarded the Contract will be required to furnish a Public Construction Bond upon the form provided herein, equal to 100 percent of the Contract price, such Bond to be executed by a surety company acceptable to the City of Tampa and licensed to underwrite contracts in the State of Florida. Surety companies shall have a rating of not less than: B+ Class VI as evaluated in the most recently circulated BEST'S KEY RATING GUIDE PROPERTY-LIABILITY.

I-2.07 SIGNATURE AND QUALIFICATIONS OF BIDDERS

Proposals must be signed in ink by the Bidder with signature in full. When a firm is a Bidder, the Proposal shall be signed in the name of the firm by one or more of the partners. When a corporation is a Bidder the officer signing shall set out the corporate name in full beneath which he shall sign his name and give the title of his office. The Proposal shall also bear the seal of the corporation attested by its secretary. Anyone signing the Proposal as agent must file with it legal evidence of his authority to do so.

Bidders who are nonresident corporations shall furnish to the City a

duly certified copy of their permit to transact business in the State of Florida, signed by the Secretary of State, within ten days of the notice to do so. Such notice will be given to Bidders who are nonresident corporations, to whom it appears an award will be made, and the copy of the permit must be filed with the City before the award will be made. Failure to promptly submit this evidence of qualification to do business in the State of Florida may be basis for rejection of the Proposal.

I-2.08 REJECTION OF PROPOSALS

The City reserves the right to reject any Proposal if investigation of the Bidder fails to satisfy the City that such Bidder is properly qualified to carry out the obligations and to complete the work contemplated therein. Any or all Proposals will be rejected if there is reason to believe that collusion exists among Bidders. Proposals will be considered irregular and may be rejected if they show serious omissions, alterations in form, additions not called for, conditions or unauthorized alternates, or irregularities of any kind. The City reserves the right to reject any or all Proposals and to waive such technical errors as may be deemed best for the interests of the City.

I-2.09 QUANTITIES ESTIMATED ONLY

The estimate of quantities of the various items of work and materials, if set forth in the Proposal Form, is approximate only and is given solely to be used as a uniform basis for the comparison of Proposals.

The quantities actually required to complete the Contract work may be less or more than so estimated, and if awarded a Contract for the work specified, the Contractor agrees that he will not make any claim for damages or for loss of profits because of a difference between the quantities of the various classes of work assumed for comparison of Proposals and quantities of work actually performed. The City further reserves the right to vary the quantities in any amount.

I-2.10 COMPARISON OF PROPOSALS

Except jobs bid on a "One Lump Sum" basis, proposals will be compared on the basis of a total computed price arrived at by taking the sum of the estimated quantity of each item and the corresponding unit price of each item, and including any lump sum prices on individual items.

The computed total prices for individual Contract Items and the total computed price for the entire Contract, as entered by the Bidder in the Proposal Form, are for convenience only and are subject to correction in the tabulation and computation of the Proposals.

I-2.11 BASIS OF AWARD

The Contract will be awarded, if at all, to the lowest responsible Bidder or Bidders, as determined by the City and by the terms and conditions of the Contract Documents. Unless all bids are rejected, the award will be made within ninety (90) days after the opening of Proposals. The successful Bidder will be required to possess, or obtain, a valid City Occupational License.

I-2.12 INSURANCE REQUIRED

The successful Bidder and his subcontractors will be required to procure and pay for insurance covering the work in accordance with the provisions of Article 6.02 of the Agreement as indicated on special instructions pages beginning with INS-1.

I-2.13 NO ASSIGNMENT OF BID

No Bidder shall assign his bid or any rights thereunder.

I-2.14 NONDISCRIMINATION IN EMPLOYMENT

Contracts for work under this Proposal will obligate the contractors and subcontractors not to discriminate in employment practices.

Bidders must, if requested, submit with their initial bid a signed statement as to whether they have previously performed work subject to the President's Executive Order Nos. 11246 and 11375.

Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the Contract.

Successful Bidders must, if requested, submit a list of all subcontractors who will perform work on the project and written,

signed statement from authorized agents of the labor pools with which they will or may deal for employees on the work together with supporting information to the effect that said labor pools practices and policies are in conformity with Executive Order No. 11246 and that said labor pools will affirmatively cooperate in or offer no hindrance to the recruitment, employment and equal treatment of employees seeking employment and performing work under the Contract, or a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish them prior to the award of the Contract.

I-2.15 LABOR STANDARDS

The Bidder's attention is directed to the Contract Provisions of the Labor Standards for federally assisted projects which may be attached to and made a part of the Agreement.

I-2.16 NOTICE TO LABOR UNIONS

If applicable, the successful Bidder will be required to provide Labor Unions and other organizations of workers a completed copy of the form entitled "Notice to Labor Unions or Other Organizations of Workers", and such form may be made a part of the Agreement.

I-2.17 NOTICE TO PROSPECTIVE FEDERALLY-ASSISTED CONSTRUCTION CONTRACTORS

A Certification of Nonsegregated Facilities, as required by the May 9, 1967, Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted to said Secretary prior to the award of a federally-assisted construction and Contract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause. The form of certification may be bound herein following the form of Bid Bond.

Contractors receiving federally-assisted construction Contract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective subcontractor for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause:

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES

"A Certification of Nonsegregated Facilities, as required by the May 9, 1967, Order (32 F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause."

"Contractors receiving subcontract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide from the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause."

The United States requires a pre-award conference if a proposed construction contract exceeds one million dollars to determine if the the prospective contractor is in compliance with the Equal Employment Opportunity requirements of Executive Order 11246 of September 24, 1965. In such instances, a meeting may be scheduled at which the prospective contractor must specify what affirmative action he has taken or proposed to take to assure equal employment opportunity which must be approved by the United States before award of the contract will be authorized.

Bidders must be prepared to submit an Equal Employment Opportunity (EEO) plan at a pre-award conference. The plan must include bidding opportunities offered by the Bidder to minority subcontractors.

On October 13, 1971, President Nixon issued Executive Order 11246 emphasizing the government's commitment to the promotion of minority business enterprise. Accordingly, the United States is firmly

committed to the utilization of available resources to support this important program. U.S. agencies are most interested in realizing minority participation on the subject. Achieving equal employment opportunity compliance is required through Executive Order 11246. WE cannot emphasize too strongly that minority subcontractors be extended subcontractors bidding opportunities as but one step in your affirmative action policy.

Due to the importance of this contract, U.S. Agencies may conduct an EEO Conference prior to the award of the Contract. It is suggested that the responsive Bidder confirm the minority subcontractors he contacted for bids or quotations in his EEO plan submitted at the conference.

I-2.18 EEO AFFIRMATIVE ACTION REQUIREMENTS

By the submission of a Proposal, each Bidder acknowledges that he understands and will agree to be bound by the equal opportunity requirements of Federal regulations which shall be applicable throughout the performance of work under any contract awarded pursuant to solicitation. Each Bidder agrees that if awarded a contract, he will similarly bind contractually each subcontractor. In policies, each Bidder further understands and agrees that if awarded a contract, he must engage in Affirmative Action directed to promoting and ensuring equal employment opportunity in the work force used under the contract (and he must require contractually the same effort of all subcontractors whose subcontracts exceed \$100,000). The Bidder understands and agrees that "Affirmative Action" as used herein shall constitute a good faith effort to achieve and maintain minority employment in each trade in the on-site work force used on the project. ***** END of SECTION *****

CITY OF TAMPA INSURANCE REQUIREMENTS

Prior to commencing any work or services or taking occupancy under that certain written agreement or award (for purposes of this document, Agreement) between the City of Tampa, Florida (City) and Firm/Awardee/Contractor/Consultant/Lessee/non-City party, etc. (for purposes of this document, Firm) to which this document is attached and incorporated as an Exhibit or otherwise, and continuing during the term of said Agreement (or longer if the Agreement and/or this document so requires), Firm shall provide, pay for, and maintain insurance against claims for injuries to persons (including death) or damages to property which may arise from or in connection with the performance of the Agreement (including without limitation occupancy and/or use of certain property/premises) by Firm, its agents, representatives, employees, suppliers, subtenants, or subcontractors (which term includes sub-consultants, as applicable) of any tier subject to the terms and conditions of this document. Firm's maintenance of insurance coverage as required herein is a material element of the Agreement and the failure to maintain or renew coverage or provide evidence of same (defined to include without limitation Firm's affirmative duty to provide from time to time upon City's request certificates of insurance, complete and certified copies of Firm's insurance policies, forms, and endorsements, information on the amount of claims payments or reserves chargeable to the aggregate amount of coverage(s) whether during the term of the Agreement or after as may be requested by the City in response to an issue or potential claim arising out of or related to the Agreement to which Firm's insurance obligations hereunder may apply or possibly help mitigate) may be treated as a material breach of the Agreement. Should at any time Firm not maintain the insurance coverages required, City at its sole option (but without any obligation or waiver of its rights) may (i) terminate the Agreement or (ii) purchase such coverages as City deems necessary to protect itself (charging Firm for same) and at City's option suspending Firm's performance until such coverage is in place. If Firm does not reimburse City for such costs within 10 days after demand, in addition to any other rights, City shall also have the right to offset such costs from amounts due Firm under any agreement with the City. All provisions intended to survive or to be performed subsequent to the expiration or termination of the Agreement shall survive, including without limitation Firm's obligation to maintain or renew coverage, provide evidence of coverage and certified copies of policies, etc. upon City's request and/or in response to a potential claim, litigation, etc.

The City reserves the right from time to time to modify or waive any or all of these insurance requirements (or to reject policies) based on the specific nature of goods/services to be provided, nature of the risk, prior experience, insurer, coverage, financial condition, failure to operate legally, or other special circumstances. If Firm maintains broader coverage and/or higher limits than the minimums shown herein, the City requires and shall be entitled to such broader coverage and/or higher limits maintained by Firm. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City. No representation is made that the minimum insurance requirements are sufficient to cover Firm's interests, liabilities, or obligations. Required insurance shall not limit Firm's liability.

Firm acknowledges and agrees Firm and not the City is the party in the best position to determine applicability (e.g. "IF APPLICABLE"), confirm, and/or verify its insurance coverage. Acceptance by the City, or by any of its employees, representatives, agents, etc. of certificates or other documentation of insurance or policies pursuant to the terms of this document and the Agreement evidencing insurance coverages and limits does not constitute approval or agreement that the insurance requirements have been met or that coverages or policies are in compliance. Furthermore, receipt, acceptance, and/or approval of certificates or other documentation of insurance or policies or copies of policies by the City, or by any of its employees, representatives, agents, etc., which indicate less coverage than required does not constitute a waiver of Firm's obligation to fulfill these insurance requirements.

MINIMUM SCOPE AND LIMIT OF INSURANCE ¹

A. Commercial General Liability (CGL) Insurance on the most current Insurance Services Office (ISO) Form CG 00 01 or its equivalent on an "occurrence" basis (Modified Occurrence or Claims Made forms are not acceptable without prior written consent of the City). Coverage must be provided to cover liability contemplated by the Agreement including without limitation premises and operations, independent contractors, contractual liability, products and completed operations, property damage, bodily, personal and advertising injury, contractual liability, explosion, collapse, underground coverages, personal injury liability, death, employees-as-insureds. Products and completed operations liability coverage maintained for at least 3 years after completion of work. Limits shall not be less than \$1M per occurrence and \$2M general aggregate for Agreements valued at \$2M or less; if valued over \$2M, a general aggregate limit that equals or exceeds the Agreement's value. If a general aggregate limit applies; it shall apply separately to the project/location (ISO CG 2S 03 or 2S 04 or equivalent). **(ALWAYS APPLICABLE)**

B. Automobile Liability (AL) Insurance in accordance with Florida law, as to the ownership, maintenance, and use of all owned, non-owned, leased, or hired vehicles. AL insurance shall not be less than: (a) \$500,000 combined single limit each occurrence bodily injury and property damage for Agreements valued at \$100,000 or less or (b) \$1M combined single limit each occurrence bodily injury and property damage for Agreements valued over \$100,000. If transportation of hazardous material involved, the MCS-90 endorsement (or equivalent). **(ALWAYS APPLICABLE)**

C. Worker's Compensation (WC) & Employer's Liability Insurance for all employees engaged under the Agreement, Worker's Compensation as required by Florida law. Employer's Liability with minimum limits of (a) \$500,000 bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each employee for Agreements valued at \$100,000 and under or (b) \$1M bodily injury by accident and each accident, bodily injury by disease policy limit, and bodily injury by disease each for all other Agreements. **(ALWAYS APPLICABLE)**

D. Excess (Umbrella) Liability Insurance for Agreements valued at \$2M or more, at least \$4M per occurrence in excess of underlying limits and no more restrictive than underlying coverage for all work performed by Firm. May also compensate for a deficiency in CGL, AL, or WC. **(ALWAYS APPLICABLE)**

E. Builder's Risk Insurance for property loss exposure associated with construction/renovation/additions to buildings or structures, including materials or fixtures to be incorporated. Must be "All Risk" form with limits of no less than the project's completed value, have no coinsurance penalties, eliminate the "occupancy clause", cover Firm (together with its contractors, subcontractors of every tier, and suppliers), and name City as a Loss Payee. **(IF APPLICABLE)**

F. Installation Floater coverage for property (usually highly valued equipment or materials such as compressors, generators, etc.) during its installation. Coverage must be "All Risk" including installation and transit for no less than 100% of the installed replacement cost value. **(IF APPLICABLE)**

G. Architects & Engineers Liability/ Professional Liability (E&O)/ Contractors Professional Liability (CPL)/ Medical Malpractice Insurance where Agreement involves Florida-regulated professional services (e.g. architect, engineer, design-builder, CM, accountant, appraiser, investment banker medical professional) at any tier, whether employed or independent, vicarious design liability exposure (e.g. construction means & methods, design supervision), value engineering, constructability assessments/reviews, BIM process, and/or performance specifications. Limits of at least \$1M per occurrence and \$2M aggregate; deletion of design/ build liability exclusions, as applicable, and maintained for at least 3 years after completion of work/services and City's acceptance of same. **(IF APPLICABLE)**

H. Railroad Protective Liability CRPL Insurance for construction within 50ft of operated railroad track(s) or where affects any railroad bridge, trestle, tunnel, track(s) roadbed, or over/under pass. Subject to involved rail road's approval prior to commencement of work. **(IF APPLICABLE)**.

I. Pollution and/or Asbestos Legal Liability Insurance where Agreement involves asbestos and/or environmental hazards/contamination risks (defined broadly, e.g. lead, mold, bacteria, fuel storage, underground work, cleanup (owned or non-owned sites), pollutant generation/transportation, marine/natural resource damage, contamination claim, restitution, business interruption, mold, fungus, lead-based paint, 3rd party claims/removal, etc.), with limits of at least \$1M per occurrence and \$2M aggregate, maintained for at least 3 years after Agreement completion. **(IF APPLICABLE)**

J. Cyber Liability Insurance where Agreement involves portals allowing access to obtain, use, or store data; managed dedicated servers; cloud hosting services; software/hardware; programming; and/or other IT services

¹ "M" indicates million(s), for example \$1M is \$1,000,000

and products are involved. Limits of not less than \$2M per occurrence and \$2M aggregate. Coverage sufficiently broad to respond to duties and obligations undertaken by Firm, and shall include, but not be limited to, claims involving infringement of intellectual property/copyright, trademark, trade dress, invasion of privacy violations, damage to or destruction of electronic information, information theft, release of confidential and/or private information, alteration of electronic information, extortion, virus transmission, and network security. Coverage, as applicable and with sufficient limits to respond, for breach response costs, regulatory fines and penalties, credit monitoring expenses. **(IF APPLICABLE)**

K. Drone/UAV Liability Insurance where Agreements involves unmanned aerial vehicles/drones. Coverage to include products and completed operations, property damage, bodily injury with limits no less than \$1M per occurrence, and \$2M aggregate; may be provided by CGL endorsement subject to City's prior written approval. **(IF APPLICABLE)**

L. Longshore & Harbor Workers' Compensation Act/Jones Act for work being conducted near, above, or on "navigable waters" for not less than the above Employer's Liability Insurance limit. **(IF APPLICABLE)**

M. Garagekeeper/Hangerkeeper/Marina Operator Legal Liability Insurance and/or Hull/P&I Insurance where parking lot, valet, dealership, garage services, towing, etc. and/or operation of a hangar, marina, or air

plane/ship repairer, providing safe berth, air/watercraft storage/docking (on land/ in water), fueling, tours, charters, ferries, dredges, tugs, mooring, towing, boat/aircraft equipment/repair/alteration/maintenance, etc.; cover- age against liability for damage to vehicles air/watercraft, their machinery in Firm's care, custody, or control both private & commercial. Limits at least equal to greater of \$1M, value of max number of vehicles that may be in Firm's custody, or of most costly object in Firm's custody. **(IF APPLICABLE)**

N. Property Insurance and Interruption of Business CIOB) Insurance where premises, building, structure, or improved real property is leased, licensed, or otherwise occupied by Firm. Property Insurance against all risks of loss to any occupant/tenant improvements at full replacement cost with no coinsurance penalty, including fire, water, leak damage, and flood, as applicable, vandalism and malicious mischief endorsements. IOB by which minimum monthly rent will be paid to City for up to 1 year if premises are destroyed, rendered inaccessible or untenable, including disruption of utilities, water, or telecommunications. **(IF APPLICABLE)**

O. Liquor Liability/Host Liquor Liability where Firm directly or indirectly provides alcoholic beverages, limits of at least \$1M per occurrence and \$1M aggregate. **(IF APPLICABLE)**

P. Educators Legal Liability Insurance where day care, after school program, recreational activities, etc. limits per G above. **(IF APPLICABLE)**

ADDITIONAL REQUIREMENTS

ACCEPTABILITY OF INSURERS- Insurance is to be placed with insurers admitted in the State of Florida and who have a current A.M. Best rating of no less than **A-:VII** or, if not rated by A.M. Best, as otherwise approved by the City in advance and in writing.

ADDITIONAL INSURED - **City, its elected officials, departments, officers, officials, employees, and volunteers together with, as applicable, any associated lender of the City shall be covered as additional insureds on all liability coverage** (e.g. CGL, AL, and Excess (Umbrella) Liability) as to liability arising out of work or operations performed by or on behalf of Firm including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of Firm. Coverage can be provided in the form of an endorsement to Firm's insurance (at least as broad as ISO Form CG 20 10 11 85 or **both** CG 10 20, CG 20 26, CG 20 33, or CG 20 38 **and** CG 20 37 if later revisions used).

CANCELLATION/NON-RENEWAL – Each insurance policy shall provide that at least 30 days written notice must be given to City of any cancellation, intent to non-renew, or material reduction in coverage (except aggregate liability limits) and at least 10 days' notice for non-payment of premium. Firm shall also have an independent duty to notify City in like manner, within 5 business days of Firm's receipt from its insurer of any notices of same. If any policy's aggregate limit is reduced, Firm shall directly take steps to have it reinstated. Notice and proof of renewal/continued coverage/certifications, etc. shall be sent to the City's notice (or Award contact) address as stated in the Agreement with a copy to the following:

- Contract Administration Department, 306 E Jackson St, Tampa, FL 33602 Purchasing Department, 306 E Jackson Street, Tampa, FL 33602
 Other: _____

CERTIFICATE OF INSURANCE (COI) – to be provided to City by insurance carrier prior to Firm beginning any work/services or taking occupancy and, if the insurance expires prior to completion of the work or services or Agreement term (as may be extended), a renewal COI at least 30 days before expiration to the above address(es). COIs shall specifically identify the Agreement and its subject (project, lease, etc.), shall be sufficiently comprehensive to insure City (named as additional insured) and Firm and to certify that coverage extends to subcontractors' acts or omissions, and as to permit the City to determine the required coverages are in place without the responsibility of examining individual policies. **Certificate Holder must be The City of Tampa, Florida.**

CLAIMS MADE – If any liability insurance is issued on a claims made form, Firm agrees to maintain such coverage uninterrupted for at least 3 years following completion and acceptance of the work either through purchase of an extended reporting provision or purchase of successive renewals. The Retroactive Date must be shown and be a date not later than the earlier of the Agreement date or the date performance/occupancy began thereunder.

DEDUCTIBLES/ SELF-INSURED RETENTIONS (SIR) – must be disclosed to City and, if over \$500,000, approved by the City in advance and in writing, including at City's option being guaranteed, reduced, or eliminated (additionally if a SIR provides a financial guarantee guaranteeing payment of losses and related investigations, claim administration, and defense expenses). Firm shall be fully responsible for any deductible or SIR (without limiting the foregoing a policy with a SIR shall provide or be endorsed to provide that the SIR may be satisfied by either the City or named insured). In the event of loss which would have been covered but for a deductible or SIR, City may withhold from any payment due Firm, under any agreement with the City, an amount equal to same to cover such loss should full recovery not be obtained under the policy.

PERFORMANCE- All insurance policies shall be fully performable in Hillsborough County, Florida (the County), and construed in accordance with Florida law. Further, all insurance policies must expressly state that the insurance company will accept service of process in the County and that the exclusive venue for any action concerning any matter under those policies shall be in the appropriate state court of the County.

PRIMARY POLICIES - Firm's insurance coverage shall be primary insurance coverage at least as broad as ISO CG 20 01 04 13 as to the City, its elected officials, departments, officers, employees, and volunteers. Any insurance or self-insurance maintained by the City, its elected officials, departments, officers, employees, and volunteers shall be excess of the Firm's insurance and shall not contribute with it.

SUBCONTRACTORS/INDEPENDENT ASSOCIATES/CONSULTANTS/SUBTENANTS/SUBLICENSEE - **Firm shall require and verify that all such entities maintain insurance meeting all requirements stated herein with the City as an additional insured** by endorsement (ISO FORM CG 20 38, or broader) or otherwise include such entities within Firm's insurance policies. Upon City's request, Firm shall furnish complete and certified copies of copies of such entities' insurance policies, forms, and endorsements.

SUBCONTRACTOR DEFAULT INSURANCE CONTROLLED INSURANCE PROGRAM, WRAP-UP. Use requires express prior written consent of City Risk Manager.

UNAVAILABILITY- To the fullest extent permitted by law, if Firm is out of business or otherwise unavailable at the time a claim is presented to City, Firm hereby assigns to the City all of its right, title and interest (but not any liabilities or obligations) under any applicable policies of insurance.

WAIVER OF SUBROGATION – With regard to any policy of insurance that would pay third party losses, Firm hereby grants City a waiver of any right to subrogation which any insurer of Firm may acquire against the City by virtue of the payment of any loss under such insurance. Firm agrees to obtain any endorsement that may be necessary to affect such waiver, but this provision shall apply to such policies regardless.

WAIVER/RELEASE AGREEMENT – Where Firm has a defined group of persons who might be exposed to harm (e.g. participants in an athletic event/program, volunteers) any waiver or release agreement used by Firm whereby such persons (and their parent/guardian as applicable) discharge Firm from claims and liabilities, shall include the City, its elected officials, departments, officers, officials, employees, and volunteers to the same extent as Firm.

Procurement Guidelines To Implement Minority & Small Business Participation

Underutilized WMBE Primes by Industry Category

FORMAL PROCUREMENT	Construction	Construction-Related	Professional	Non-Professional	Goods
	Black	Asian	Black	Black	Black
	Hispanic	Native Am.	Hispanic	Asian	Hispanic
	Native Am.	Woman	Asian	Native Am.	Asian
	Woman		Native Am.		Native Am.
			Woman		Woman

Underutilized WMBE Sub-Contractors / Sub-Consultants

SUB WORK	Construction	Construction-Related	Professional	Non-Professional	Goods
	Black	Black	Black	Black	Black
		Asian	Hispanic	Asian	Asian
		Native Am.	Asian	Native Am.	Native Am.
		Woman	Native Am.		Woman
			Woman		

Policy

The Guidelines apply to formal procurements and solicitations. WMBE participation will be narrowly-tailored.

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- Black = Black/African-American Business Enterprise
- Hispanic = Hispanic Business Enterprise
- Asian = Asian Business Enterprise
- Native Am. = Native American Business Enterprise
- Woman = Woman Business Enterprise (Caucasian)

Industry Categories

Construction is defined as: new construction, renovation, restoration, maintenance of public improvements and underground utilities.

Construction-Related Services are defined as: architecture, professional engineering, landscape architecture, design build, construction management services, or registered surveying and mapping.

Professional Services are defined as: attorney, accountant, medical doctor, veterinarian, miscellaneous consultant, etc.

Non-Professional Services are defined as: lawn maintenance, painting, janitorial, printing, hauling, security guard, etc.

Goods are defined as: all supplies, materials, pipes, equipment, machinery, appliances, and other commodities.

MBD Form-70

D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements
FY 20 Project 20-C-00021
U-WMBE Availability Contact List
(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

This Certified Contact List is the minimum contacts available and may require further searches for certified firms to meet Good Faith Efforts.												
#	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
2	Allen Masonry & General Contractor, Inc.	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	4710 Dunquin Pl	Tampa	FL	33610	Stucco	993752366	BBE	African American
2	E/S Concrete Service, Inc.	727-560-0957	727-821-5029	enorisslyst@yahoo.com	726 E. Harbor Drive	St. Petersburg	FL	33705	Stucco	993119582	BBE	African American
2	LMCC Specialty Contractors	407-298-6936	407-290-1217	lynn@mimmsconstruction.com	119 S PINE HILLS RD	ORLANDO	FL	32818	Stucco	993442318	BBE	African American
2	Paragon Building Contractors, Inc.	813-935-1600	813-932-1108	aldavisparagon@gmail.com	1201 W WATERS AVENUE	TAMPA	FL	33604	Stucco	992464751	BBE	African American
2	Provisions Construction & Development, Inc.	407-985-2442	407-985-2440	marrington@provisionscdi.com	3401 Lake Breeze Drive Bldg 601	Orlando	FL	32808	Stucco	462802435	BBE	African American
3	Pro Construct Services LLC	813-445-4840	813-749-9383	roberta.warren@pro-constructllc.com	6601 Memorial Hwy	TAMPA, FL	FL	33615	Drywall	464782775	BBE	African American
4	CARTER'S CARPET & UPHOLSTERY, INC.	813-787-3920	727-642-7365	carterscarpetcleanup@gmail.com	12964 Kings Crossing Dr	Gibsonton	FL	33534	Flooring	811740837	BBE	African American
4	Envision-CS, Inc	813-997-0330	813-464-7677	info@envision-cs.com	5000 Acline Drive East	Tampa	FL	33619	Flooring	264124511	BBE	African American
4	Versa-Tile & Marble, Inc.	850-259-4667		shaun.womack@versatilemi.com	1620 Sand Hollow Lane	Valrico	FL	33594	Flooring	841634057	BBE	African American
5	Fletcher Painting, Inc.	407-290-1188	407-290-9309	stacy@fletcherenterprise.com	4355 Fairmont Street Suite 8	Orlando	FL	32808	Painting	993587717	BBE	African American
5	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	P.O.Box 234	Mango	FL	33550	Painting	471881723	BBE	African American
5	Pro Construct Services LLC	813-445-4840	813-749-9383	roberta.warren@pro-constructllc.com	6601 Memorial Hwy	TAMPA, FL	FL	33615	Painting	464782775	BBE	African American
7	Pro Construct Services LLC	813-445-4840	813-749-9383	roberta.warren@pro-constructllc.com	6601 Memorial Hwy	TAMPA, FL	FL	33615	Millwork	464782775	BBE	African American
8	Pro-Fit Development, Inc.	813-514-8783	813-231-8866	Info@Pro-FitDevelopment.com	4007 N Taliaferro Ave.	Tampa	FL	33603	Roofing	432013650	BBE	African American
8	R L Building Contractors Inc	813-516-6489	813-200-8105	rlbuildingcontractors@yahoo.com	4701 East Hanna Avenue	Tampa	FL	33610	Roofing	262703712	BBE	African American
8	Reeves Building and Plumbing Contractor, Inc.	813-238-6197	813-238-6197	reevesbuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Roofing	9930011515	BBE	African American
#	Pro Construct Services LLC	813-445-4840	813-749-9383	roberta.warren@pro-constructllc.com	6601 Memorial Hwy	TAMPA, FL	FL	33615	Doors/Hardware	464782775	BBE	African American
#	Pro Construct Services LLC	813-445-4840	813-749-9383	roberta.warren@pro-constructllc.com	6601 Memorial Hwy	TAMPA, FL	FL	33615	Restroom Upgrade	464782775	BBE	African American
#	ABS Enterprises	813-542-6272		absenterprises@aol.com	11226 Southwind Lake Dr	Gibsonton	FL	33534	Landscaping	851020544	BBE	African American
#	BAY LIGHT, LLC	813-972-4057	813-971-0882	baylightllc25@gmail.com	1717 E Busch Blvd	Tampa	FL	33612	Landscaping	455079825	BBE	African American
#	BUN Construction Co., Inc.	813-931-8270	813-931-9185	bunconstruction@tampabay.rr.com	4135 E. Hillsborough Avenue	Tampa	FL	33610	Landscaping	993362663	BBE	African American
#	Cut-Ups Lawn Service	813-361-8871	813-238-2397	cutupslawnservice@yahoo.com	3217 East Powhatan Ave.	Tampa	FL	33610	Landscaping	811412916	BBE	African American
#	David's lawncare	813-334-4096		davidrasheed2@gmail.com	9885 Morris Glen Way	Tampa	FL	33687	Landscaping	89662164	BBE	African American

D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements
FY 20 Project 20-C-00021
U-WMBE Availability Contact List

(The Underutilized WMBE Industry Category for Construction Subcontracts is BBE)

#'s	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
#	Dean's Environmental Inc	813-428-2011		deank8859@gmail.com	11809 Autumn Creek Dr	Riverview	FL	33569	Landscaping	74774375	BBE	African American
#	Grass & Landscaping Hunters LLC	813-770-6795		grasslandscapinghunters@hotmail.com	914 Burlwood St	Brandon	FL	33511	Landscaping	21161283	BBE	African American
#	irene&pe's lawn care &tree trimming	813-928-0124		rechibutler@yahoo.com	2921 E 33rd Ave	Tampa	FL	33610	Landscaping	62612745	BBE	African American
#	Moses & Wourman Maintenance Inc.	813-244-7134	813-920-1430	ctmoses11@msn.com	13014 N Dale Mabry Ste 136	Tampa	FL	33618	Landscaping	50105210	BBE	African American
#	Promise Construction and Repair Solutions LLC	813-988-8633	813-988-1555	promisecarell@outlook.com	10711 North 53rd Street	TAMPA	FL	33617	Landscaping	64723775	BBE	African American
#	T. C. C Enterprise Inc	813-606-9148	813-237-0396	tcc_inc@live.com	3902 E POWHATAN AVE	TAMPA	FL	33610	Landscaping	63223645	BBE	African American
#	Trimen Precision Lawn Care, LLC	813-863-9328		account@trimenlawn.com	1004 Lady Guinevere Drive	Valrico	FL	33594	Landscaping	74625126	BBE	African American
#	Twenty-Nine 11 Property Services, LLC	813-420-4987		twenty-nine11propertieservices@gmail.com	13736 Ogakor Dr	Riverview	FL	33579	Landscaping	41949792	BBE	African American
#	WC Boxes, Inc.	813-478-1102	813-864-4386	wcindustries2003@gmail.com	17620 Lake Key Drive	Odessa	FL	33556	Landscaping	72682190	BBE	African American
#	Yahweh Lawn Care & Landscaping Inc.	727-303-5609		Yahwehlawn@gmail.com	2621 Emerson ave S.	St. Petersburg	FL	33712	Landscaping	72424364	BBE	African American
#	Kenstruction Dynamics, Inc.	813-732-1962		bakari.kennedy@kenstruction.net	1210 Millennium Parkway	Brandon	FL	33511	Special Constructio	14326698	BBE	African American
#	Reggies Affordable Heating & Cooling, LLC	813-453-5752	941-737-7781	reggie@reggiesac.com	5614 E 29th Ave	Tampa	FL	33619	Conveyor Systems	05282459	BBE	African American
#	RHC and Associates Inc	813-254-0907	813-254-0744	jrobin19@tampabay.rr.com	2338 W. Palmetto St.	Tampa	FL	33607	Conveyor Systems	93046707	BBE	African American
#	VoltAir Consulting Engineers, INC	813-867-4899	813-867-4566	jdavis@voltairinc.com	220 West 7th Avenue	Tampa	FL	33602	Conveyor Systems	04452969	BBE	African American
#	LFC Specialties, LLC	813-415-2901		Linda@lfcspecialties.com	3604 E Dr Martin Luther King Jr Blvd	Tampa	FL	33610	Fire Sprinkler	30868790	BBE	African American
#	Reeves Building and Plumbing Contractor, Inc.	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Plumbing	93011515	BBE	African American
#	Exceptional Air & Heating LLC	813-610-2299		exceptionalair@gmail.com	30311 Birdhouse Dr	Wesley Chal	FL	33545	Mechanical	72811243	BBE	African American
#	FOUNDATION MECHANICAL LLC	813-613-1723		wesley.patterson@foundation-mech.com	1717 E Busch Blvd	Tampa	FL	33612	Mechanical	20824395	BBE	African American
#	Just Koolin Air Conditioning and Heating, Inc.	813-546-8667	813-325-2145	Justkoolinac.adm@gmail.com	4210 E 22nd Ave	Tampa	FL	33605	Mechanical	55494658	BBE	African American
#	Process Control & Instrumentation LLC (PCI)	313-874-5877	313-871-0641	bclay@pcivetrix.com	401 N. Rosemary Avenue	West Palm	FL	33401	Mechanical	383569266	BBE	African American
#	Reggies Affordable Heating & Cooling, LLC	813-453-5752	941-737-7781	reggie@reggiesac.com	5614 E 29th Ave	Tampa	FL	33619	Mechanical	05282459	BBE	African American
#	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVENUE	TAMPA	FL	33604	Electrical	43689273	BBE	African American
#	Brown & Brown Electric, Inc.	954-938-8986	954-938-9272	Hermine.Brown@brownandbrownelectric.com	1150 SW 30th Avenue	Pompano Bl	FL	33069	Electrical	92283934	BBE	African American
#	MDH Enterprises, Inc.	386-789-2672	866-681-5026	imatize@my-es.com	281 East. C Street	Orange City	FL	32763	Electrical	50849332	BBE	African American
#	VoltAir Constructors, LLC	813-867-4899	813-867-4566	kwilliams@voltairinc.com	6005 Benjamin Rd	Tampa	FL	33634	Electrical	72756788	BBE	African American

African American/Black Business Enterprises (BBE) shall count toward the subcontract goal. Refer to MBD Form 70 - Procurement Guidelines.

Instructions Regarding Use of the WMBE/SLBE Availability Contact List

Bidders must solicit a subcontracting bid from ALL of the firms listed on the WMBE/SLBEs list provided within the Specifications, and provide documentation of emails, faxes, phone calls, letters, or other communication with the firms as a first step in demonstrating Good-Faith Efforts to achieve the goal set for WMBE/SLBE participation on this contract.

The list is formatted to facilitate e-mailing of a solicitation to the listed firms by copying and pasting the email addresses.

The WMBE/SLBE participation Goal is based upon the availability of the certified firms indicated on the contact list. The Goal and Requirements of the City's Equal Business Opportunity Program are stated in the Bid/Contract Document, Specifications.

PROPOSAL

To the Mayor and City Council of the City of Tampa, Florida:

Legal Name of Bidder: _____

Bidder's Fictitious Name, if applicable: _____

Bidder is a/an: Individual Partnership* Joint Venture* LLC Corp. Other:

Bidder is organized under the laws of: State of Florida Other:

Bidder Mailing Address: _____

Bidder's Federal Employee Identification No. (FEI/EIN): _____

Bidder's License No.: _____ Bidder's FDOS (SUNBIZ) Doc. No.: _____
(See Ch. 489. FS; use entity's, individual's only if applicable)

Bidder Contact Name**: _____ Email: _____ Phone: (____) _____

Bidder's own initial application for employment has criminal history screening practices similar in nature to the practices contained in Chapter 12, Article VI, City of Tampa Code (*Responses, whether "Yes" or "No", are for informational purposes only and will not be used as a basis of award or denial, nor as a basis for any protest*): Yes No

The below named person, appearing before the undersigned authority and after being first duly sworn, for him/herself and on behalf of the entity submitting this Proposal does hereby affirm and declare as follows:

- (1) He/She is of lawful age and is authorized to act on behalf of Bidder (the individual, partnership, corporation, entity, etc. submitting this Proposal) and that all statements made in this document are true and correct to the best of my knowledge.
- (2) If Bidder is operating under a fictitious name, Bidder has currently complied with any and all laws and procedures governing the operation of businesses under fictitious names in the State of Florida
- (3) No person or entity other than Bidder has any interest in this Proposal or in the Contract proposed to be entered into.
- (4) This Proposal is made without any understanding, agreement, or connection with any person or entity making Proposal for the same purposes, and is in all respects fair and without collusion or fraud.
- (5) Bidder is not in arrears to the City of Tampa, upon debt or contract, and is not a defaulter, as surety or otherwise, upon any obligation to the City of Tampa.
- (6) That no officer or employee or person whose salary is payable in whole or in part from the City Treasury is, shall be or become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise, in this Proposal, or in the performance of the Contract, or in the supplies, materials, or equipment and work or labor to which it relates, or in any portion of the profits thereof.
- (7) Bidder has carefully examined and fully understands the Solicitation and has full knowledge of the scope, nature, and quality of the work to be performed; furthermore, Bidder has carefully examined the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials and the kinds and extent of equipment and other facilities needed for the performance of the work, the general and local conditions and all difficulties to be encountered, and all other items which may, in any way, affect the work or its performance.
- (8) Bidder (including its principals) has | has NOT been debarred or suspended from contracting with a public entity.
- (9) Bidder has | has NOT implemented a drug-free workplace program that meets the requirements of Section 287.087, Florida Statutes.
- (10) Bidder has carefully examined and fully understands all the component parts of the Contract Documents and agrees Bidder will execute the Contract, provide the required Public Construction Bond, and will fully perform the work in strict accordance with the terms of the Contract and Contract Documents therein referred to for the following prices, to wit:

* If a Partnership or Joint Venture, attach Partnership or Joint Venture Agreement.

** Someone the City may contact with questions/correspondence regarding this Solicitation and/or permits.

Contract Item No.	Unit	Estimated Quantity	Description and Price in Words	Computed Total Price for Item in Figures
BASE BID	LS		The work includes the furnishing of all labor, equipment, and material for preserving or restoring certain historic features of an existing structure, selective demolition, cutting and patching, termite control, concrete slab repair, roofing, building insulation, architectural finishes, casework, related mechanical, electrical, fire protection and plumbing work, equipment purchase and installation, and with all associated work required for a complete project in accordance with the Contract Documents.”	
			_____ dollars and _____ cents	
BASE BID	LS			\$ _____
CONTINGENCY ALLOWANCE	LS	1	Three Hundred Twenty Thousand dollars And zero cents	
				\$ <u>320,000.00</u>
LUMP-SUM ALLOWANCE	LS	1	Two Thousand Five Hundred dollars And zero cents	
				\$ <u>2,500.00</u>
UNIT-COST ALLOWANCE (Unit price for Carpet - Materials only)	LS	1	Fourteen Thousand Five Hundred Fifty dollars And zero cents	
				\$ <u>14,550.00</u>
UNIT-COST ALLOWANCE (Unit price for Ceramic Wall Tiles- Materials only)	LS	1	Fourteen Thousand Seven Hundred Fifty dollars And zero cents	
				\$ <u>14,750.00</u>
TOTAL	LS	1	_____ dollars and _____ cents	
			TOTAL	\$ _____

Computed Total Price in Words: _____
 _____ dollars and _____ cents.

Computed Total Price in Figures: \$ _____

Bidder acknowledges that the following addenda have been received and that the changes covered by the addendum(s) have been taken into account in this proposal: #1 ____ #2 ____ #3 ____ #4 ____ #5 ____ #6 ____ #7 ____ #8 ____.

Bidder acknowledges the requirements of the City of Tampa's Equal Business Opportunity Program.

Bidder acknowledges that it is aware of Florida's Trench Safety Act (Sections 553.60-553.64, Florida Statutes), and agrees that Bidder together with any involved subcontractors will comply with all applicable trench safety standards. Bidder further acknowledges that included in the various items of this Proposal and the total bid price (as applicable) are costs for complying with the Trench Safety Act. Bidder further identifies the costs and methods summarized below:

	Trench Safety Measure (Description)	Unit of Measure (LF, SY)	Unit Quantity	Unit Cost	Extended Cost
A.	_____	_____	_____	_____	_____
B.	_____	_____	_____	_____	_____
C.	_____	_____	_____	_____	_____
Total Cost: \$				_____	

Accompanying this Proposal is a certified check, cashier's check or Tampa Bid Bond (form included herein must be used) for at least five percent (5%) of the total amount of the Proposal which check shall become the property of the City, or which bond shall become forthwith due and payable to the City, if this Proposal shall be accepted by the City and the Bidder shall fail to enter into a legally binding contract with and to furnish the required Public Construction Bond to the City within twenty (20) days after the date of its receipt of written Notice of Award by the City so to do.

FAILURE TO COMPLETE THE ABOVE MAY RESULT IN THE PROPOSAL BEING DECLARED NON-RESPONSIVE.

[SEAL] Name of Bidder: _____
 Authorized Signature: _____
 Signer's Printed Name: _____
 Signer's Title: _____

STATE OF _____
 COUNTY OF _____

For an entity: The forgoing instrument was Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____, 2020, by _____ as _____ of _____, a/n Partnership Joint Venture LLC Corp Other: _____, on behalf of such entity. Such individual is Personally Known OR Produced Identification. Type of Identification Produced: _____

For an individual: The forgoing instrument was Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____, 2020, By _____, Such individual is Personally Known OR Produced Identification. Type of Identification Produced: _____.

[NOTARY SEAL] _____
 Notary Public, State of _____
 Notary Printed Name: _____
 Commission No.: _____
 My Commission Expires: _____



Good Faith Effort Compliance Plan Guidelines

for Women/Minority Business Enterprise/Small Local Business Enterprise Participation
City of Tampa - Equal Business Opportunity Program
(MBD Form 50 – detailed instructions on page 2 of 2)

Contract Name _____ Bid Date _____

Bidder/Proposer _____

Signature _____ Date _____

Name _____ Title _____

The Compliance Plan with attachments is a true account of Good Faith Efforts (GFE) made to achieve the participation goals as specified for Women/Minority Business Enterprises/Small Local Business Enterprises (WMBE/SLBE) on the referenced contract:

The WMBE/SLBE participation **Goal is Met or Exceeded**. See DMI Forms 10 and 20 which accurately report **all** subcontractors **solicited** and **all** subcontractors **to-be-utilized**.

The WMBE/SLBE participation Goal is **Not Achieved**. The following list is an overview of the baseline GFE action steps already performed. Furthermore, it is understood that these GFE requirements are weighted in the compliance evaluation based on the veracity and demonstrable degree of documentation provided with the bid/proposal:

(Check applicable boxes below. Must enclose supporting documents accordingly with remarks)

- (1) Solicited through reasonable and available means the interest of WMBE/SLBEs that have the capability to perform the work of the contract. The Bidder or Proposer must solicit this interest within sufficient time to allow the WMBE/SLBEs to respond. The Bidder or Proposer must take appropriate steps to follow up initial solicitations with interested WMBE/SLBEs. See DMI report forms for subcontractors solicited. See enclosed supplemental data on solicitation efforts. Qualifying Remarks:
- (2) Provided interested WMBE/SLBEs with adequate, specific scope information about the plans, specifications, and requirements of the contract, including addenda, in a timely manner to assist them in responding to the requested-scope identified by bidder/proposer for the solicitation. See enclosed actual solicitations used. Qualifying Remarks:
- (3) Negotiated in good faith with interested WMBE/SLBEs that have submitted bids (e.g. adjusted quantities or scale). Documentation of negotiation must include the names, addresses, and telephone numbers of WMBE/SLBEs that were solicited; the date of each such solicitation; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why agreements could not be reached with WMBE/SLBEs to perform the work. Additional costs involved in soliciting and using subcontractors is not a sufficient reason for a bidder/proposer's failure to meet goals or achieve participation, as long as such costs are reasonable. Bidders are not required to accept excessive quotes in order to meet the goal. DMI Utilized Forms for sub-(contractor/consultant) reflect genuine negotiations This project is an RFO/RFP in nature and negotiations are limited to clarifications of scope/specifications and qualifications. See enclosed documentation. Qualifying Remarks:
- (4) Not rejecting WMBE/SLBEs as being unqualified without justification based on a thorough investigation of their capabilities. The WMBE/SLBEs standing within its industry, membership in specific groups, organizations / associations and political or social affiliations are not legitimate causes for rejecting or not soliciting bids to meet the goals. Not applicable. See attached justification for rejection of a subcontractor's bid or proposal. Qualifying Remarks:
- (5) Made scope(s) of work available to WMBE/SLBE subcontractors and suppliers; and, segmented portions of the work or material consistent with the available WMBE/SLBE subcontractors and suppliers, so as to facilitate meeting the goal. Sub-Contractors were allowed to bid on their own choice of work or trade without restriction to a pre-determined portion. See enclosed comments. Qualifying Remarks:
- (6) Made good faith efforts, despite the ability or desire of Bidder/Proposer to perform the work of a contract with its own forces/organization. A Bidder/Proposer who desires to self-perform the work of a contract must demonstrate good faith efforts if the goal has not been met. Sub-Contractors were not prohibited from submitting bids/proposals and were solicited on work typically self-performed by the prime. Qualifying Remarks:
- (7) Segmented portions of the work to be performed by WMBE/SLBEs in order to increase the likelihood that the goals will be met. This includes, where appropriate, breaking out contract work items into economically feasible units (quantities/scale) to facilitate WMBE/SLBE participation, even when the Bidder/Proposer might otherwise prefer to perform these work items with its own forces. Sub-Contractors were allowed to bid on their own choice of work or trade without restriction to a pre-determined portion. Sub-Contractors were not prohibited from submitting bids/proposals and were solicited on work typically self-performed by the prime. See enclosed comments. Qualifying Remarks:
- (8) Made efforts to assist interested WMBE/SLBEs in obtaining bonding, lines of credit, or insurance as required by the city or contractor. See enclosed documentation on initiatives undertaken and methods to accomplish. Qualifying Remarks:
- (9) Made efforts to assist interested WMBE/SLBEs in obtaining necessary equipment, supplies, materials, or related assistance or services, including participation in an acceptable mentor-protégé program. See enclosed documentation of initiatives and/or agreements. Qualifying Remarks:
- (10) Effectively used the services of the City and other organizations that provide assistance in the recruitment and placement of WMBE/SLBEs. See enclosed documentation. The following services were used:

Note: Provide any unsolicited information that will support the Bid/RFP Compliance Evaluation. Named Documents Are:



Participation Plan: Guidance for Complying with Good Faith Efforts Outreach
(page 2 of 2)

1. All firms on the WMBE/SLBE Goal Setting List must be solicited and documentation provided for email, fax, letters, phone calls, and other methods of outreach/communication with the listed firms. The DMI Solicited and DMI-Utilized forms must be completed for all firms solicited or utilized. Other opportunities for subcontracting may be explored by consulting the City of Tampa MBD Office and/or researching the on-line Diversity Management Business System Directory for Tampa certified WMBE/SLBE firms.
2. Solicitation of WMBE/SLBEs, via written or electronic notification, should provide specific information on the services needed, where plans can be reviewed and assistance offered in obtaining these, if required. Solicitations should be sent a minimum of a week (i.e. 5 business days or more) before the bid/proposal date. Actual copies of the bidder's solicitation containing their scope specific instructions should be provided.
3. With any quotes received, a follow-up should be made when needed to confirm detail scope of work. For any WMBE/SLBE low quotes rejected, an explanation shall be provided detailing negotiation efforts.
4. If a low bid WMBE/SLBE is rejected or deemed unqualified the contractor must provide an explanation and supporting documentation for this decision.
5. Prime shall break down portions of work into economical feasible opportunities for subcontracting. The WMBE/SLBE directory may be useful in identifying additional subcontracting opportunities and firms not listed in the "WMBE/SLBE Goal Setting Firms List."
6. Contractor shall not preclude WMBE/SLBEs from bidding on any part of work, even if the Contractor may desire to self-perform the work.
7. Contractor shall avoid relying solely on subcontracting out work-scope where WMBE/SLBE availability is not sufficient to attain the pre-determined subcontract goal set for the Bid or when targeted sub-consultant participation is stated within the RFP/RFQ.
8. In its solicitations, the Bidder should offer assistance to WMBE/SLBEs in obtaining bonding, insurance, et cetera, if required of subcontractors by the City or Prime Contractor.
9. In its solicitation, the Bidder should offer assistance in obtaining equipment for a specific job to WMBE/SLBEs, if needed.
10. Contractor should use the services offered by such agencies as the City of Tampa Minority and Small Business Development Office, Hillsborough County Entrepreneur Collaborative Center, Hillsborough County Economic Development Department's MBE/SBE Program and the NAACP Empowerment Center to name a few for the recruitment and placement of WMBEs/SLBEs.



Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive

**Page 1 of 4 – DMI Solicited/Utilized Schedules
City of Tampa – Schedule of **All Solicited** Sub-(Contractors/Consultants/Suppliers)
(FORM MBD-10)**

Contract No.: _____ Contract Name: _____
 Company Name: _____ Address: _____
 Federal ID: _____ Phone: _____ Fax: _____ Email: _____

Check applicable box(es). Detailed Instructions for completing this form are on page 2 of 4.

- No Firms were contacted or solicited for this contract.
- No Firms were contacted because: _____
- See attached list of additional Firms solicited and all supplemental information (List must comply to this form)
Note: Form MBD-10 must list ALL subcontractors solicited including Non-minority/small businesses

NIGP Code Categories: Buildings = 909, General = 912, Heavy = 913, Trades = 914, Architects = 906, Engineers & Surveyors = 925, Supplier = 912-77

S = SLBE W=WMBE O = Neither	Company Name Address Phone, Fax, Email	Type of Ownership (F=Female M=Male) BF BM = African Am. HF HM = Hispanic AF AM = Asian Am. NF NM = Native Am. CF CM = Caucasian	Trade or Services NIGP Code (listed above)	Contact Method L=Letter F=Fax E=Email P=Phone	Quote or Response Received Y/N

Failure to Complete, Sign and Submit
this form with your Bid or Proposal
Shall render the Bid Non-Responsive
(Do Not Modify This Form)

It is hereby certified that the information provided is an accurate and true account of contacts and solicitations for sub-contracting opportunities on this contract.

Signed: _____ Name/Title: _____ Date: _____

**Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive
Forms must be included with Bid / Proposal**



Instructions for completing The Sub-(Contractors/Consultants/ Suppliers) Solicited Form (Form MBD-10)

This form must be submitted with all bids or proposals. All subcontractors (regardless of ownership or size) solicited and subcontractors from whom unsolicited quotations were received must be included on this form. The instructions that follow correspond to the headings on the form required to be completed. Note: Ability or desire to self-perform all work shall not exempt the prime from Good Faith Efforts to achieve participation.

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business and/or doing business as (dba) if applicable.
- **Address.** The physical address of your business.
- **Federal ID.** FIN. A number assigned to your business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **No Firms were contacted or solicited for this contract.** Checking the box indicates that a pre-determined Subcontract Goal or Participation Plan Requirement was not set by the City resulting in your business not using subcontractors and will self-perform all work. If during the performance of the contract you employ subcontractors, the City must pre-approve subcontractors. Use of the “Sub-(Contractors/Consultants/Suppliers) Payments” form (MBD Form-30) must be submitted with every pay application and invoice. Note: Certified **SLBE or WMBE firms** bidding as Primes **are not exempt** from outreach and solicitation of subcontractors.
- **No Firms were contacted because.** Provide brief explanation why no firms were contacted or solicited.
- **See attached documents.** Check box, if after you have completed the DMI Form in its entirety, you need more space to list additional firms and/or if you have supplemental information/documentation relating to the form. All DMI data not submitted on the MBD Form-10 must be in the same format and have all requested data from MBD Form-10 included.

The following instructions are for information of any and all subcontractors solicited.

- **“S” = SLBE, “W” = WMBE.** Enter “S” for firms Certified by the City as Small Local Business Enterprises and/or “W” for firms Certified by the City as either Women/Minority Business Enterprise; **“O” = Non-certified others.**
- **Federal ID.** FIN. A number assigned to a business for tax reporting purposes. This information is critical in proper identification and payment of the contractor/subcontractor.
- **Company Name, Address, Phone & Fax.** Provide company information for verification of payments.
- **Type of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business.
- **Trade, Services, or Materials** indicate the trade, service, or materials provided by the subcontractor. NIGP codes aka “National Institute of Governmental Purchasing” are listed at top section of document.
- **Contact Method L=letter, F=fax, E=Email, P=Phone.** Indicate with letter the method(s) of soliciting for bid.
- **Quote or Resp. (response) Rec’d (received) Y/N.** Indicate “Y” Yes if you received a quotation or if you received a response to your solicitation. Indicate “N” No if you received no response to your solicitation from the subcontractor. Must keep records: log, ledger, documentation, etc. that can validate/verify.

If additional information is required or you have questions, please contact the Equal Business Opportunity Program - Minority and Small Business Development Office at (813) 274-5522.



Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive

**Page 3 of 4 – DMI Solicited/Utilized Schedules
City of Tampa – Schedule of All To-Be-Utilized Sub-(Contractors/Consultants/Suppliers)
(FORM MBD-20)**

Contract No.: _____ Contract Name: _____
Company Name: _____ Address: _____
Federal ID: _____ Phone: _____ Fax: _____ Email: _____

Check applicable box(es). Detailed Instructions for completing this form are on page 4 of 4.

See attached list of additional Firms Utilized and all supplemental information (List must comply to this form)

Note: Form MBD-20 must list ALL subcontractors To-Be-Utilized including Non-minority/small businesses

No Subcontracting/consulting (of any kind) will be performed on this contract.

No Firms are listed to be utilized because: _____

NIGP Code General Categories: Buildings = 909, General = 912, Heavy = 913, Trades = 914, Architects = 906, Engineers & Surveyors = 925, Supplier = 912-77

Enter "S" for firms Certified as Small Local Business Enterprises, "W" for firms Certified as Women/Minority Business Enterprise, "O" for Other Non-Certified

S = SLBE W=WMBE O =Neither	Company Name Address Phone, Fax, Email	Type of Ownership (F=Female M=Male) BF BM = African Am. HF HM = Hispanic Am. AF AM = Asian Am. NF NM = Native Am. CF CM = Caucasian	Trade, Services, or Materials NIGP Code Listed above	\$ Amount of Quote. Letter of Intent (LOI) if available	Percent of Scope or Contract %

Failure to Complete, Sign and Submit
this form with your Bid or Proposal
Shall render the Bid Non-Responsive.
(Do Not Modify This Form)

Total ALL Subcontract / Supplier Utilization \$ _____
Total SLBE Utilization \$ _____
Total WMBE Utilization \$ _____
Percent SLBE Utilization of Total Bid/Proposal Amt. _____% Percent WMBE Utilization of Total Bid/Proposal Amt. _____%

It is hereby certified that the following information is a true and accurate account of utilization for sub-contracting opportunities on this Contract.

Signed: _____ Name/Title: _____ Date: _____

**Failure to Complete, Sign and Submit Both Forms 10 & 20 SHALL render the Bid or Proposal Non-Responsive
Forms must be included with Bid / Proposal**



Page 4 of 4 DMI – Solicited/**Utilized**

Instructions for completing **The Sub-(Contractors/Consultants/ Suppliers) to be Utilized Form (Form MBD-20)**

This form must be submitted with all bids or proposals. All subcontractors (regardless of ownership or size) projected to be utilized must be included on this form. Note: Ability or desire to self-perform all work shall not exempt the prime from Good Faith Efforts to achieve participation.

Contract No. This is the number assigned by the City of Tampa for the bid or proposal.

- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business and/or doing business as (dba) if applicable.
- **Address.** The physical address of your business.
- **Federal ID. FIN.** A number assigned to your business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **No Subcontracting/consulting (of any kind) will be performed on this contract.** Checking box indicates your business will not use subcontractors when no Subcontract Goal or Participation Plan Requirement was set by the City, but will self-perform all work. When subcontractors are utilized during the performance of the contract, the “Sub-(Contractors/Consultants/Suppliers) Payments” form (MBD Form-30) must be submitted with every pay application and invoice. Note: certified **SLBE or WMBE firms** bidding as Primes **are not exempt** from outreach and solicitation of subcontractors, including completion and submitting Form-10 and Form-20.
- **No Firms listed To-Be-Utilized.** Check box; provide brief explanation why no firms were retained when a goal or participation plan requirement was set on the contract. Note: mandatory compliance with Good Faith Effort outreach (GFECF) requirements applies (MBD Form-50) and supporting documentation must accompany the bid.
- **See attached documents.** Check box, if after completing the DMI Form in its entirety, you need more space to list additional firms and/or if you have supplemental information/documentation relating to the scope/value/percent utilization of subcontractors. Reproduce copies of MBD-20 and attach. All data not submitted on duplicate forms must be in the same format and content as specified in these instructions.

The following instructions are for information of Any and All subcontractors To Be Utilized.

- **Federal ID. FIN.** A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **“S” = SLBE, “W” = WMBE.** Enter “S” for firms Certified by the City as Small Local Business Enterprises and/or “W” for firms Certified by the City as Women/Minority Business Enterprise; **“O” = Non-certified others.**
- **Company Name, Address, Phone & Fax.** Provide company information for verification of payments.
- **Type of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business.
- **Trade, Services, or Materials (NIGP code if Known)** Indicate the trade, service, or material provided by the subcontractor. Abbreviated list of NIGP is available at <http://www.tampagov.net/mbd> “Information Resources”.
- **Amount of Quote, Letters of Intent** (required for both SLBEs and WMBEs).
- **Percent of Work/Contract.** Indicate the percent of the total contract price the subcontract(s) represent. For CCNA only (i.e. Consultant A/E Services) you must indicate subcontracts as percent of total scope/contract.
- **Total Subcontract/Supplier Utilization.** – Provide total dollar amount of all subcontractors/suppliers projected to be used for the contract. (Dollar amounts may be optional in CCNA depending on solicitation format).
- **Total SLBE Utilization.** Provide total dollar amount for all projected SLBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Total WMBE Utilization.** Provide total dollar amount for all projected WMBE subcontractors/Suppliers used for this contract. (Dollar amounts may be optional in CCNA proposals depending on the solicitation format).
- **Percent SLBE Utilization.** Total amount allocated to SLBEs divided by the total bid/proposal amount.
- **Percent WMBE Utilization.** Total amount allocated to WMBEs divided by the total bid/proposal amount.

If additional information is required or you have questions, please contact the Equal Business Opportunity Program - Minority and Small Business Development Office at (813) 274-5522.

TAMPA BID BOND

Contract 20-C-00021; D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements

KNOW ALL MEN BY THESE PRESENTS, that we, _____

(hereinafter called the Principal) and _____

(hereinafter called the Surety) a Corporation chartered and existing under the laws of the State of _____, with its principal offices in the City of _____, and authorized to do business in the State of Florida, are held and firmly bound unto the City of Tampa, a Municipal Corporation of Hillsborough County, Florida, in the full and just sum of 5% of the amount of the (Bid) (Proposal) good and lawful money of the United States of America, to be paid upon demand of the City of Tampa, Florida, to which payment will and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally and firmly these presents.

WHEREAS, the Principal is about to submit, or has submitted to the City of Tampa, Florida, a Proposal for the construction of certain facilities for the City designated Contract 20-C-00021, D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements.

WHEREAS, the Principal desires to file this Bond in accordance with law, in lieu of a certified Bidder's check otherwise required to accompany this Proposal.

NOW, THEREFORE: The conditions of this obligation are such that if the Proposal be accepted, the Principal shall, within twenty (20) days after the date of receipt of written Notice of Award, execute a contract in accordance with the Proposal and upon the terms, conditions and price set forth therein, in the form and manner required by the City of Tampa, Florida and execute a sufficient and satisfactory Public Construction Bond payable to the City of Tampa, Florida in an amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to said City, then this Bid Bond obligation is to be void; otherwise to be and remain in full force and virtue in law, and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid City, upon demand, the amount thereof, in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20____.

Principal

BY _____

TITLE _____

BY _____

TITLE _____

(SEAL)

Producing Agent

Producing Agent's Address

Name of Agency

The addition of such phrases as "not to exceed" or like import shall render the (Bid) (Proposal) non-responsive.

AGREEMENT

For furnishing all labor, materials and equipment, together with all work incidental thereto, necessary and required for the performance of the work for the construction of Contract 20-C-00021 in accordance with your Proposal dated _____, amounting to a total of \$ _____ as completed in accordance with subsections I-2.09 and I-2.10 of the Instruction to Bidders.

This AGREEMENT, made and entered into in triplicate, between the City of Tampa, Florida, hereinafter called the City, and _____ hereinafter called the Contractor, as of the _____ day of _____, 20__ when the City Council of the City of Tampa, Florida adopted a Resolution authorizing, among other things, the Mayor's execution of this Agreement.

WITNESSETH that, in consideration of the mutual stipulations, agreements, and covenants herein contained, the parties hereto have agreed and hereby agree with each other, the Party of the First Part for itself, its successors and assigns, and the Party of the Second Part for itself, or himself, or themselves, and its successors and assigns, or his or their executors, administrators and assigns, as follows:

Contract 20-C-00021; D.L. Tippin Administration Building Rehabilitation – Phase 1- Building and Site Improvements, shall include, but not be limited to, furnishing of all labor, equipment, and material for preserving or restoring certain historic features of the Administration Building, selective demolition, cutting and patching, termite control, concrete slab repair, roofing, building insulation, architectural finishes, casework, related mechanical, electrical, fire protection and plumbing work, equipment purchase and installation,, and with all associated work required for a complete project in accordance with the Contract Documents.”

Contract Documents referred to in Article 1.01 of this Agreement also includes this volume, applicable standard drawings, the plans and any provisions referred to whether actually attached or not.

TAMPA AGREEMENT

SECTION 1 GENERAL

ARTICLE 1.01 THE CONTRACT

Except for titles, subtitles, headings, running headlines, and tables of contents (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, constitute the Contract:

The Notice to Bidders;
The Instructions to Bidders, including Special Instructions and General Instructions;
The Proposal;
The Bid Bond;
The Certification of Nonsegregated Facilities;
The Notice of Award;
The Agreement;
The Performance Bond;
The Notice To Proceed;
The Specifications, including the General Provisions, the Workmanship and Materials, the Specific Provisions or the Contract Items
The Plans;
All Supplementary Drawings Issued after award of the Contract;
All Addenda issued by the City prior to the receipt of proposals;
All provisions required by law to be inserted in this Contract, whether actually inserted or not.

ARTICLE 1.02 DEFINITIONS

The following words and terms, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless different meaning is clear from the context:

(a)"City" shall mean the City of Tampa, Florida, represented by its Mayor and City Council, Party of the First Part, or such other City official as shall be duly empowered to act for the City on matters relating to this Contract.

(b)"Contractor" shall mean the Party of the Second Part hereto, whether corporation, firm or individual, or any combination thereof, and its, their, or his successors, personal representatives, executors, administrators, and assigns, and any person, firm or corporation who or which shall at any time be substituted in the place of the Party of the Second Part under this Contract.

(c)"Engineer" shall mean the Director of the Department or his duly authorized representative.

(d)"Consultant" shall mean the engineering or architectural firm or individual employed by the City to consult with and advise the City in the construction of the project.

(e)"Surety" shall mean any person, firm or corporation that has executed as Surety the Contractor's Performance Bond securing the performance of this Contract.

(f)"The Work" shall mean everything expressly or implied required to be furnished and done by the Contractor under the Contract, and shall include both Contract Work

and Extra Work.

(g)"Contract Work" shall mean everything expressly or implied required to be furnished and done by the Contractor by any one or more of the Contract parts referred to in Article 1.01 hereof, except Extra Work, as hereinafter defined; it being understood that, in case of any inconsistency in or between any part or parts of this Contract, the Engineer shall determine which shall prevail.

(h)"Contract" or "Contract Documents" shall mean each of the various part of the Contract referred to in Article 1.01 hereof, both as a whole and severally.

(i)"Extra Work" shall mean work other than that required either expressly or implied by the contract in its present form.

(j)"Plans" shall mean only those drawings specifically referred to as such in these documents, or in any Addendum. Drawings issued after the execution of the Contract to explain further, or to illustrate, or to show changes in the work, will be known as "Supplementary Drawings" and shall be binding upon the Contractor with the same force as the Plans.

(k)"Specifications" shall mean all of the directions, requirements, and standards of performance applying to the work, as hereinafter detailed and designated as such, or which may be issued in an addendum.

(l)"Addendum or Addenda" shall mean the additional contract provisions issued in writing prior to the receipt of bids.

(m)"Notice" shall mean written notice. Notice shall be served upon the Contractor, either personally or by leaving the said notice at his residence or with any employee found on the work, or addressed to the Contractor at the residence or place of business given in his proposal and deposited in a postpaid wrapper in any post office box regularly maintained by the United States Post Office.

(n)"Project" shall mean the entire improvement package or related work. The "project" may consist of several different, but related, contracts.

(o)"Site" shall mean, and be limited to, the area upon or in which the Contractor's operations are carried on and such other appropriate areas as may be designed as such by the Engineer.

(p)"Subcontractor" shall mean any person, firm, or corporation, other than employees of the Contractor, who or which contracts with the Contractor to furnish, or actually furnishes labor, or labor and materials, or labor and equipment or labor, materials, and equipment at the site.

(q)Whenever in the Contract the words "directed", "required", "permitted", "ordered", "designated", "prescribed", and words of like import are used, they shall imply the direction, requirement, permission, order, designation, or prescription of the Engineer; and "approved", "acceptable", "satisfactory", "in the judgement of", and words of like import shall mean approved by, or acceptable to, or satisfactory to, or in the judgment of the Engineer.

(r)Whenever in the Contract the word "day" is used, it shall mean calendar day.

(s)"Final Acceptance" shall mean acceptance of the

work as evidenced by an official resolution of the City. Such acceptance shall be deemed to have taken place only if and when an approving resolution has been adopted by the City Council. The final acceptance shall be signed only after the City has assured itself by tests, inspection, or otherwise, that all of the provisions of the Contract have been carried out to its satisfaction.

(t)"Eastern Standard Time" shall be construed as the time being observed in the City on the day proposals are received or other documents issued or signed.

SECTION 2 POWERS OF THE CITY'S REPRESENTATIVES

ARTICLE 2.01 THE ENGINEER

It is covenanted and agreed that the Engineer, in addition to those matters elsewhere herein expressly made subject to his determination, direction, or approval, shall have the power, subject to such express provisions and limitations herein contained as are not in conflict herewith, and subject to review by the Mayor and City Council:

(a)To monitor the performance of the work.

(b)To determine the amount, kind, quality, sequence, and location of the work to be paid for hereunder and, when completed, to measure such work for payment.

(c)To determine all questions of an engineering character in relation to the work, to interpret the Plans, Specifications and Addenda.

(d)To determine how the work of this Contract shall be coordinated with the work of other contractors engaged simultaneously on this project.

(e)To make minor changes in the work as he deems necessary, provided such changes do not result in a net increase in the cost to the City or to the Contractor of the work to be done under the Contract.

(f)To amplify the Plans, add explanatory information and furnish additional Specifications and Drawings consistent with the intent of the Contract Documents.

The power of the Engineer shall not be limited to the foregoing enumeration, for it is the intent of this Contract that all of the work shall be subject to his determinations and approval, except where the determination or approval of someone other than the Engineer is expressly called for herein and except as subject to review by the Mayor and City Council. All orders of the Engineer requiring the Contractor to perform work as Contract work shall be promptly obeyed by the Contractor.

The Engineer shall not, however, have the power to issue an extra work order, and the performance of such work on the order of the Engineer without previously obtaining written confirmation thereof from the Mayor in accordance with Article 7.02 hereof may constitute a waiver of any right to extra compensation therefor. The Contractor is warned that the Engineer has no power to change the terms and provisions of this Contract, except minor changes where such change results in no net increase in the Contract Price.

ARTICLE 2.02 DIRECTOR

The Director of the Department in addition to those matters

expressly made subject to his determination, direction or approval in his capacity as "Engineer", shall also have the power:

(a)To review any and all questions in relation to this Contract and its performance, except as herein otherwise specifically provided, and his determination upon such review shall be final and conclusive upon the Contractor.

(b)With the approval of the Mayor and City Council to authorize modifications or changes in the Contract so as to require: (1) the performance of extra work, or (2) the omission of Contract work whenever he deems it in the interest of the City to do so, or both.

(c)To suspend the whole or any part of the work whenever, in his judgment, such suspension is required: (1) in the interest of the City generally, or (2) to coordinate the work of the various Contractors engaged on this project, or (3) to expedite the completion of the entire project, even though the completion of this particular Contract may be thereby delayed, without compensation to the Contractor for such suspension other than extending the time for the completion of the work, as much as it may have been, in the opinion of the City, delayed by such a suspension.

(d)If, before the final acceptance of all the work contemplated herein, it shall be deemed necessary to take over, use, occupy, or operate any part of the completed or partly completed work, the Engineer shall have the right to do so and the Contractor will not, in any way, interfere with or object to the use, occupation, or operation of such work by the City after receipt of notice in writing from the Engineer that such work or part thereof will be used by the City on and after the date specified in such notice. Such taking over, use, occupancy or operation of any part of the completed or partially completed work shall not constitute final acceptance or approval of any such part of the work.

ARTICLE 2.03 NO ESTOPPEL

The City shall not, nor shall any department, officer, agent, or employee thereof, be bound, precluded, or estopped by any determination, decision, acceptance, return, certificate, or payment made or given under or in connection with this Contract by any officer, agent or employee of the City at any time either before or after final completion and acceptance of the work and payment therefor: (a) from showing the true and correct classification, amount, quality, or character of the work done, or that any determination, decision, acceptance, return certificate or payment is untrue, incorrect or improperly made in any particular, or that the work or any part thereof does not in fact conform to the requirements of the Contract Documents, and (b) from demanding and recovering from the Contractor any overpayments made to him or such damages as it may sustain by reason his failure to comply with the requirements of the Contract of Documents, or both.

ARTICLE 2.04 NO WAIVER OF RIGHTS

Neither the inspection, nor any order, measurements or certificate of the City or its employees, officers, or agents, nor by any order of the City for payment of money, nor any money, nor payments for or acceptance of the whole or any part of the work by the City, nor any extension of time, nor any changes in the Contract, Specifications or Plans, nor any possession by the City or its employees shall operate as a

waiver of any provisions of this Contract, nor any power herein provided nor shall any waiver of any breach of this Contract be held as a waiver of any other subsequent breach.

Any remedy provided in this Contract shall be taken and construed as cumulative, namely, in addition to each and every other suit, action, or legal proceeding. The City shall be entitled as of right to an injunction against any breach of the provisions of this Contract.

SECTION 3 PERFORMANCE OF WORK

ARTICLE 3.01 CONTRACTOR'S RESPONSIBILITY

The Contractor shall do all the work and furnish, at his own cost and expense, all labor, materials, equipment, and other facilities, except as herein otherwise provided, as may be necessary and proper for performing and completing the work under this Contract. The Contractor shall be responsible for the entire work until completed and finally accepted by the City.

The work shall be performed in accordance with the true intent and meaning of the Contract Documents. Unless otherwise expressly provided, the work must be performed in accordance with the best modern practice, with materials as specified and workmanship of the highest quality, all as determined by and entirely to the satisfaction of the Engineer.

Unless otherwise expressly provided, the means and methods of construction shall be such as the Contractor may choose, subject, however, to the approval of the Engineer. Only adequate and safe procedure, methods, structures and equipment shall be used. The Engineer's approval or the Engineer's failure to exercise his right thereon shall not relieve the Contractor of obligations to accomplish the result intended by the Contract, nor shall such create a cause of action for damages.

ARTICLE 3.02 COMPLIANCE WITH LAWS

The Contractor must comply with all local, State and Federal laws, rules, ordinances and regulations applicable to this Contract and to the work done hereunder, and must obtain, at his own expense, all permits, licenses or other authorization necessary for the prosecution of the work.

No work shall be performed under this Contract on Sundays, legal holidays or after regular working hours without the express permission of the Engineer. Where such permission is granted, the Engineer may require that such work be performed without additional expense to the City.

ARTICLE 3.03 INSPECTION

During the progress of the work and up to the date of final acceptance, the Contractor shall, at all times, afford the representatives of the City, the Florida Department of Environmental Regulation, and if applicable, the Federal Environmental Protection Agency and the Federal Department of Labor every reasonable, safe and proper facility for inspecting the work done or being done at the

site. The inspection of any work shall not relieve the Contractor of any of his obligations to perform proper and satisfactory work as herein specified. Finished or unfinished work found not to be in strict accordance with the Contract shall be replaced as directed by the Engineer, even though such work may have been previously approved and payment made therefor.

The City shall have the right to reject materials and workmanship which are defective or require their correction. Rejected work and materials must be promptly removed from the site, which must at all times be kept in a reasonably clean and neat condition.

Failure or neglect on the part of the City to condemn or reject bad or inferior work or materials shall not be construed to imply an acceptance of such work or materials, if it becomes evident at any time prior to the final acceptance of the work by the City. Neither shall it be construed as barring the City at any subsequent time from the recovery of damages of such a sum of money as may be needed to build anew all portions of the work in which inferior work or improper materials were used, wherever found.

Should it be considered necessary or advisable by the City at any time before final acceptance of the entire work to make examinations of work already completed, by removing or tearing out all or portions of such work, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material for that purpose. If such work is found to be defective in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the cost of examination and restoration of the work shall be considered an item of extra work to be paid for in accordance with the provisions of Article 7.02 hereof.

ARTICLE 3.04 PROTECTION

During performance and until final acceptance, the Contractor shall be under an absolute obligation to protect the finished and unfinished work against any damage, loss, or injury. The Contractor shall take proper precaution to protect the finished work from loss or damage, pending completion and the final acceptance of all the work included in the entire Contract, provided that such precaution shall not relieve the Contractor from any and all liability and responsibility for loss or damage to the work occurring before final acceptance by the City. Such loss or damage shall be at the risk of and borne by the Contractor, whether arising from acts or omissions of the Contractor or others. In the event of any such loss or damage, the Contractor shall forthwith repair, replace, and make good the work without extension of time therefor, except as may be otherwise provided herein.

The provisions of this Article shall not be deemed to create any new right of action in favor of third parties against the Contractor or the City.

ARTICLE 3.05 PRESERVATION OF PROPERTY

The Contractor shall preserve from damage all property along the line of the work, or which is in the vicinity of or is in anywise affected by the work, the removal or destruction of which is not called for by the Plans. This applies, but is not limited, to the public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, public streets (except natural wear and tear of streets resulting from legitimate use thereof by the Contractor), and wherever such property is damaged due to the activities of the Contractor, it shall be immediately restored to its original condition by the Contractor and at his own expense.

In case of failure on the part of the Contractor to restore such property, or make good such damage or injury, the City may, upon forty-eight (48) hour written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any monies due or which may become due the Contractor under this Contract. Nothing in this clause shall prevent the Contractor from receiving proper compensation for the removal, damage, or replacement of any public or private property not shown on the Plans, when this is made necessary by alteration of grade or alignment authorized by the Engineer, provided that such property has not been damaged through fault of the Contractor, his employees or agents.

ARTICLE 3.06 BOUNDARIES

The Contractor shall confine his equipment, apparatus, the storage of materials, supplies and apparatus of his workmen to the limits indicated on the plans, by law, ordinances, permits or direction of the Engineer.

ARTICLE 3.07 SAFETY AND HEALTH REGULATIONS

The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91- 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL91-54).

ARTICLE 3.08 TAXES

All taxes of any kind and character payable on account of the work done and materials furnished under this Contract shall be paid by the Contractor and shall be deemed to have been included in his bid. The laws of the State of Florida provide that sales and use taxes are payable by the Contractor upon the tangible personal property incorporated in the work and such taxes shall be paid by the Contractor and shall be deemed to have been included in his bid.

ARTICLE 3.09 ENVIRONMENTAL CONSIDERATIONS

The Contractor, in the performance of the work under this Contract, shall comply with all Local, State and Federal laws, statutes, ordinances, rules and regulations applicable to protection of the environment; and, in the event he violates any of the provisions of same, he shall be answerable to the Local, State and Federal agencies designated by law to protect the environment. In the event the City receives, from any of the environmental agencies, a citation which is occasioned by an act or omission of the Contractor or his

subcontractor or any officers, employees or agents of either, it is understood and agreed that the Contractor shall automatically become a party-respondent under said citation; and the City immediately shall notify the Contractor and provide him with a copy of said citation.

The Contractor shall comply with the requirements of the citation and correct the offending conditions(s) within the time stated in said citation and further shall be held fully responsible for all fines and/or penalties.

**SECTION 4
TIME PROVISIONS**

ARTICLE 4.01 TIME OF START AND COMPLETION

The Contractor must commence work within thirty (30) days subsequent to the date of the receipt of the "Notice to Proceed" by the City unless otherwise provided in the Specific Provisions and Special Instructions. Time being of the essence of this Contract, the Contractor shall thereafter prosecute the work diligently, using such means and methods of construction as well as secure its full completion in accordance with the requirements of the Contract Documents no later than the date specified therefor, or on the date to which the time for completion may be extended.

The Contractor must complete the work covered by this Contract in the number of consecutive calendar days set forth in the Instructions to Bidders, unless the date of completion is extended pursuant to the provisions of Article 4.05 hereof.

The period for performance shall start from the date of signing of this Agreement by the City.

The actual date of completion will be established after a final inspection as provided in Article 4.07 hereof.

ARTICLE 4.02 PROGRESS SCHEDULE

To enable the work to be laid out and prosecuted in an orderly and expeditious manner, the Contractor shall submit to the Engineer a proposed progress schedule within fifteen (15) days after the award of this Contract.

The schedule shall state the Contract starting date, time for completion and date of completion and shall show the anticipated time of starting and completion of each of the various operations to be performed under this Contract, together with all necessary and appropriate information regarding sequence and correlation of work and an estimated time required for the delivery of all materials and equipment required for the work. The proposed schedule shall be revised as directed by the Engineer until finally approved by him, and, after such approval, shall be strictly adhered to by the Contractor. The approved progress schedule may be changed only with the written permission of the Engineer.

If the Contractor shall fail to adhere to the approved progress schedule or the schedule as revised, he shall promptly adopt such other or additional means and methods of construction as will make up for the time lost, and will assure completion in accordance with the contract time.

ARTICLE 4.03 APPROVAL REQUESTS

From time to time, as the work progresses and in the sequence indicated by the approved schedule, the Contractor must submit to the Engineer a specific request, in writing, for each item of information or approval required of him by the Contract. These requests must be submitted sufficiently in advance of the date upon which the information or approval is actually required by the Contractor to allow for the time the Engineer may take to act upon such submissions or resubmissions. The Contractor shall not have any right to an extension of time on account of delays due to his failure to submit his requests for the required information or the required approval in accordance with these requirements.

ARTICLE 4.04 COORDINATION WITH OTHER CONTRACTORS

During progress of the work, other Contractors may be engaged in performing other work on this project or on other projects on the site. In that event, the Contractor shall coordinate the work to be done hereunder with the work of such other Contractors in such manner as the Engineer may direct.

ARTICLE 4.05 EXTENSION OF TIME

If such an application is made, the Contractor shall be entitled to an extension of time for delay in completion of the work should the Contractor be obstructed or delayed in the commencement, prosecution or completion of any part of said work by any act or delay of the City, or by acts or omissions of other Contractors on this project, or by a riot, insurrection, war, pestilence, acts of public authorities, fire, lightning, hurricanes, earthquakes, tornadoes, floods, extremely abnormal and excessive inclement weather as indicated by the records of the local weather bureau for a five-year period preceding the date of the Contract, or by strikes, or other causes, which causes of delay mentioned in this Article, in the opinion of the City, are entirely beyond the expectation and control of the Contractor.

The Contractor shall, however, be entitled to an extension of time for such causes only for the number of days of delay which the City may determine to be due solely to such causes and only to the extent that such occurrences actually delay the completion of the project and then only if the Contractor shall have strictly complied with all of the requirements of Articles 4.01, 4.02, 4.03 and 4.04 hereof. It is hereby understood that the determination by the Engineer as to the order and sequence of the work shall not in itself constitute a basis for extension of time.

The determination made by the City on an application for an extension of time shall be binding and conclusive on the Contractor.

Delays caused by failure of the Contractor's materialmen, manufacturers, and dealers to furnish approved working drawings, materials, fixtures, equipment, appliances, or other fittings on time or failure of subcontractors to perform their work shall not constitute a basis of extension of time.

The Contractor agrees to make no claim for damages for delay in the performance of this Contract occasioned by any

act or omission to act of the City or any of its representatives or because of any injunction which may be brought against the City or its representatives and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the work as provided herein.

ARTICLE 4.06 LIQUIDATED DAMAGES

It is mutually agreed between the parties that time is the essence of this Contract and that there will be on the part of the City considerable monetary damage in the event the Contractor should fail to complete the work within the time fixed for completion in the Contract or within the time to which such completion may have been extended.

The amount per day set forth in the Instructions to Bidders is hereby agreed upon as the liquidated damages for each and every calendar day that the time consumed in completing the work under this Contract exceeds the time allowed.

This amount shall, in no event, be considered as a penalty or otherwise than as the liquidated and adjusted damages to the City because of the delay and the Contractor and his Surety agree that the stated sum per day for each such day of delay shall be deducted and retained out of the monies which may become due hereunder and if not so deductible, the Contractor and his Surety shall be liable therefor.

ARTICLE 4.07 FINAL INSPECTION

When the work has been completed in accordance with the requirements of the Contract and final cleaning up performed, a date for final inspection of the work by the Engineer shall be set by the Contractor in a written request therefor, which date shall be not less than ten (10) days after the date of such request. The work will be deemed complete as of the date so set by the Contractor if, upon such inspection, the Engineer determines that no further work remains to be done at the site.

If such inspection reveals interms of work still to be performed, however, the Contractor shall promptly perform them and then request a reinspection. If, upon such inspection, the Engineer determines that the work is complete, the date of final completion shall be deemed to be the last day of such reinspection.

**SECTION 5
SUBCONTRACTS AND ASSIGNMENTS**

ARTICLE 5.01 LIMITATIONS AND CONSENT

The Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this Contract or of his right, title, or interest therein, or his power to execute such Contract, or to assign any monies due or to become due thereunder to any other person, firm or corporation unless the previous written consent of the City shall first be obtained thereto and the giving of any such consent to a particular subcontract or assignment shall not dispense with the necessity of such consent to any further or other assignment.

Before making any subcontract, the Contractor must submit a

written statement to the Engineer, giving the name and address of the proposed contractor, the portion of the work and materials which he is to perform and furnish and any other information tending to prove that the proposed subcontractor has the necessary facilities, skill, integrity, past experience and financial resources to perform the work in accordance with the terms and conditions of this Contract.

If the City finds that the proposed subcontractor is qualified, the Contractor will be notified in writing. The City may revoke approval of any subcontractor when such subcontractor evidences an unwillingness or inability to perform his work in strict accordance with these Contract Documents. Notice of such revocation of approval will be given in writing to the Contractor.

The Contractor will promptly, upon request, file with the City a conformed copy of the subcontract. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of these Contract Documents, insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontracts that the City may exercise over the Contractor under provisions of these Contract Documents.

The Contractor shall be required to perform with his own forces at least twenty-five (25) percent of the work, unless written consent to subcontract a greater percentage of the work is first obtained from the City.

ARTICLE 5.02 RESPONSIBILITY

The approval by the City of a subcontractor shall not relieve the Contractor of any of his responsibilities, duties, and liabilities hereunder. The Contractor shall be solely responsible to the City for the acts or defaults or omissions of his subcontractor and of such subcontractor's officers, agents, and employees, each of whom shall for all purposes be deemed to be the agent or employee of the Contractor. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and the City.

SECTION 6 SECURITY AND GUARANTY

ARTICLE 6.01 CONTRACT SECURITY

The Contractor shall execute and deliver to the City a Performance Bond on the form as provided herein, in an amount at least equal to one hundred (100) percent of the full Contract price, such Bond to be executed by a surety company acceptable to the City. The surety on such Performance Bond shall be a surety company duly authorized to do business in the State of Florida, and the Bond shall be issued or countersigned by a local resident producing agent of such surety company who is a resident of the State of Florida, regularly commissioned and licensed in said State, and satisfactory evidence of the authority of the person or persons executing such Bond shall be submitted with the Bond. The Performance Bond shall serve as security for the faithful performance of this Contract, including

maintenance and guaranty provisions, and for the payment of all persons performing labor and furnishing materials in connection with the Contract. The premiums on the Performance Bond shall be paid by the Contractor.

If, at any time, the City shall become dissatisfied with any surety or sureties then upon the Performance Bond, or if for any other reason such bond shall cease to be adequate security for the City, the Contractor shall, within five days after notice so to do, substitute an acceptable Bond in such form and sum and signed by such other sureties as may be satisfactory to the City. The premiums on such Bond shall be paid by the Contractor. No further partial payments shall be deemed due or shall be made until the new sureties have qualified.

ARTICLE 6.02 CONTRACTORS INSURANCE

Insurance required shall be as indicated on Special Instructions pages beginning with "INS-1"

ARTICLE 6.03 AGAINST CLAIMS AND LIENS

The City may withhold from the Contractor as much as any approved payments to him as may, in the opinion of the City, be necessary to secure (a) just claims of any persons supplying labor or materials to the Contractor or any of his subcontractors for the work then due and unpaid; (b) loss due to defective work not remedied, or (c) liability, damage, or loss due to injury to persons or damages to the work or property of other contractors, subcontractors, or others, caused by the act or neglect of the Contractor or of any of his subcontractors. The City shall have the right, as agent for the Contractor, to apply any such amounts so withheld in such manner as the City may deem proper to satisfy such claims or to secure such protection. Such application of such money shall be deemed payments for the account of the Contractor.

ARTICLE 6.04 MAINTENANCE AND GUARANTY

The Contractor hereby guarantees all the work furnished under this Contract against any defects in workmanship and materials for a period of one year following the date of final acceptance of the work by the City. Under this guarantee, the Contractor hereby agrees to make good, without delay, at his own expense, any failure of any part of the work due to faulty materials or manufacture, construction, or installation, or the failure of any equipment to perform satisfactorily all the work put upon it within the limits of the Contract Documents, and further, shall make good any damage to any part of the work caused by such failure. It is hereby agreed that the Performance Bond shall fully cover all guarantees contained in this Article.

It is also agreed that all warranties, expressed or implied, inure to the benefit of the City and are enforceable by the City.

SECTION 7 CHANGES

ARTICLE 7.01 MINOR CHANGES

The City reserves the right to make such additions, deductions, or changes to this Contract from time to time as

it deems necessary and in a manner not materially affecting the substance thereof or materially changing the price to be paid in order to carry out and complete more fully and perfectly the work herein agreed to be done and performed. This Contract shall in no way be invalidated by any such additions, deductions, or changes, and no claim by the Contractor shall be made for any loss of anticipated profits thereby.

Construction conditions may require that minor changes be made in the location and installation of the work and equipment to be furnished and other work to be performed hereunder, and the Contractor when ordered by the Engineer, shall make such adjustments and changes in said locations and work as may be necessary, without additional cost to the City, provided such adjustments and changes do not alter the character, quantity of cost of the work as a whole, and provided further that Plans and Specifications showing such adjustments and changes are furnished to the Contractor by the City within a reasonable time before any work involving such adjustment and changes is begun. The Engineer shall be the sole judge of what constitutes a minor change for which no additional compensation shall be allowed.

ARTICLE 7.02 EXTRA WORK

The City may at any time by a written order and without notice to the sureties require the performance of such extra work as it may find necessary or desirable. An order for extra work shall be valid only if issued in writing and signed by the Mayor and the work so ordered must be performed by the Contractor.

The amount of compensation to be paid to the Contractor for any extra work as so ordered shall be determined as follows:

(a) By such applicable unit prices, if any, as are set forth in the Proposal; or

(b) If no such unit prices are set forth then by a lump sum or other unit prices mutually agreed upon by the City and the Contractor; or

(c) If no such unit prices are set forth in the Proposal and if the parties cannot agree upon a lump sum or other unit prices then by the actual net cost in money to the Contractor of the extra work performed, which cost shall be determined as follows:

(1) For all labor and foreman in direct charge of the authorized operations, the Contractor shall receive the current local rate of wages to be agreed upon, in writing, before starting such work for each hour that said labor and foremen are actually engaged thereon, to which shall be added an amount equal to 25 percent of the sum thereof which shall be considered and accepted as full compensation for general supervision, FICA taxes, contributions under the Florida Unemployment Compensation Act, insurance, bond, subcontractor's profit and overhead, the furnishing of small tools and miscellaneous equipment used, such as picks, shovels, hand pumps, and similar items.

(2) For all materials used, the Contractor shall receive the actual cost of such materials delivered at the site or previously approved delivery point as established by original receipted bills. No percentage shall be added to this cost.

(3) For special equipment and machinery such as power-driven pumps, concrete mixers, trucks, and tractors, or other equipment, required for the economical performance of the authorized work, the Contractor shall receive payment based on the average local area rental price for each item of equipment and the actual time of its use on the work. No percentage shall be added to this sum.

(4) Records of extra work done under this procedure shall be reviewed at the end of each day by the Contractor or his representative and the Engineer. Duplicate copies of accepted records shall be made and signed by both Contractor or his representative and the Engineer, and one copy retained by each.

Request for payment for approved and duly authorized extra work shall be submitted in the same form as Contract work or in the case of work performed under paragraph (c) (1) above upon a certified statement supported by receipted bills. Such statement shall be submitted for the current Contract payment for the month in which the work was done.

ARTICLE 7.03 DISPUTED WORK

If the Contractor is of the opinion that any work required, necessitated, or ordered violates the terms and provisions of this Contract, he must promptly notify the Engineer, in writing, of his contentions with respect thereto and request a final determination thereof. If the Engineer determines that the work in question is Contract work and not extra work or that the order complained of is proper, he will direct the Contractor to proceed and the Contractor shall promptly comply. In order, however, to reserve his right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within five (5) days after receiving notice of the Engineer's determination and direction, notify the City in writing that the work is being performed or that the determination and direction is being complied with under protest. Failure of the Contractor to notify shall be deemed as a waiver of claim for extra compensation or damages therefor.

Before final acceptance by the City, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Final determinations and decisions, in case any questions shall arise, shall constitute a condition precedent to the right of the Contractor to receive the money therefor until the matter in question has been adjusted.

ARTICLE 7.04 OMITTED WORK

The City may at any time by a written order and without notice to the sureties require the omission of such Contract work as it may find necessary or desirable.

An order for omission of work shall be valid only if signed by the Mayor and the work so ordered must be omitted by the Contractor. The amount by which the Contract price shall be reduced shall be determined as follows:

(a) By such applicable unit prices, if any, as are set forth in the Contract; or

(b) By the appropriate lump sum price set forth in the Contract; or

(c) By the fair and reasonable estimated cost to the City

of such omitted work as determined by the Engineer and approved by the City.

SECTION 8 CONTRACTOR'S EMPLOYEES

ARTICLE 8.01 CHARACTER AND COMPETENCY

The Contractor and his subcontractors shall employ upon all parts of the work herein contracted for only competent, skillful, and trustworthy workers. Should the Engineer at any time give notice, in writing, to the Contractor or his duly authorized representative on the work that any employee in his opinion is incompetent, unfaithful, disorderly, careless, unobservant of instructions, or in any way a detriment to the satisfactory progress of the work, such employee shall immediately be dismissed and not again allowed upon the site.

ARTICLE 8.02 SUPERINTENDENCE

The Contractor shall give his personal supervision to the faithful prosecution of the work and in case of his absence shall have a competent, experienced, and reliable supervisor or superintendent, acceptable to the Engineer on the site who shall follow without delay all instructions of the Engineer in the prosecution and completion of the work and every part thereof, in full authority to supply workers, material, and equipment immediately. He shall keep on hand at all times copies of the Contract Documents.

ARTICLE 8.03 EMPLOYMENT OPPORTUNITIES

The Contractor shall, in the performance of the work required to be done under this Contract, employ all workers without discrimination regarding race, creed, color, sex or national origin and must not maintain or provide facilities that are segregated on the basis of race, color, creed or national origin.

ARTICLE 8.04 RATES OF WAGES

On federally assisted projects, the rates of wages to be paid under this Contract shall not be less than the rates of wages set forth in Section 12 of this Agreement.

On other projects, no wage rate determination is included. Florida's Prevailing Wage Law (Section 215.19, Florida Statutes) was repealed effective April 25, 1979.

ARTICLE 8.05 PAYROLL REPORTS

The Contractor and each subcontractor shall, if requested to do so, furnish to the Engineer a duly certified copy of his payroll and also any other information required by the Engineer to satisfy him that the provisions of the law as to the hours of employment and rate of wages are being observed.

Payrolls shall be prepared in accordance with instructions furnished by the City and on approved forms. The Contractor shall not carry on his payroll any persons not employed by him. Subcontractor's employees shall be carried only on the payrolls of the employing subcontractor.

SECTION 9 CONTRACTOR'S DEFAULT

ARTICLE 9.01 CITY'S RIGHT AND NOTICE

It is mutually agreed that: (a) if the Contractor fails to begin work when required to do so, or (b) if at any time during the progress of the work it shall appear to the Engineer that the Contractor is not prosecuting the work with reasonable speed, or is delaying the work unreasonably and unnecessarily, or (c) if the force of workmen or quality or quantity of material furnished are not sufficient to insure completion of the work within the specified time and in accordance with the Specifications hereto attached, or (d) if the Contractor shall fail to make prompt payments for materials or labor or to subcontractors for work performed under the Contract, or (e) if legal proceedings have been instituted by others than the City in such manner as to interfere with the progress of the work and may subject the City to peril of litigation or outside claims of (f) if the Contractor shall be adjudged a bankrupt or make an assignment for the benefit of creditors, or (g) if in any proceeding instituted by or against the Contractor an order shall be made or entered granting an extension of time of payment, composition, adjustment, modification, settlement or satisfaction of his debts or liabilities, or (h) if a receiver or trustee shall be appointed for the Contractor or the Contractor's property, or (i) if the Contract or any part thereof shall be sublet without the consent of the City being first obtained in writing, or (j) if this Contract or any right, monies, or claim thereunder shall be assigned by the Contractor, otherwise than as herein specified, or (k) if the Contractor shall fail in any manner of substance to observe the provisions of this Contract, or (l) if any of the work, machinery, or equipment shall be defective, and shall not be replaced as herein provided, or (m) if the work to be done under this Contract shall be abandoned, then such fact or conditions shall be certified by the Engineer and thereupon the City without prejudice to any other rights or remedies of the City, shall have the right to declare the Contractor in default and so notify the Contractor by a written notice, setting forth the ground or grounds upon which such default is declared and the Contractor must discontinue the work, either as a portion of the work or the whole thereof, as directed.

ARTICLE 9.02 CONTRACTOR'S DUTY UPON DEFAULT

Upon receipt of notice that his Contract is in default, the Contractor shall immediately discontinue all further operations on the work or such part thereof, and shall immediately quit the site or such part thereof, leaving untouched all plant, materials, equipment, tools, and supplies.

ARTICLE 9.03 COMPLETION OF DEFAULTED WORK

The City, after declaring the Contractor in default, may then have the work completed or the defective equipment or machinery replaced or anything else done to complete the work in strict accordance with the Contract Documents by such means and in such manner, by Contract with or without public letting, or otherwise, as it may deem advisable,

utilizing for such purpose without additional cost to the City such of the Contractor's plant, materials, equipment, tools, and supplies remaining on the site, and also such subcontractors as it may deem advisable.

The City shall reimburse all parties, including itself, for the expense of such completion, including liquidated damages, if any, and the cost of reletting. The City shall deduct this expense from monies due or to become due to the Contractor under this Contract, or any part thereof, and in case such expense is more than the sum remaining unpaid of the original contract price, the Contractor and his sureties shall pay the amount of such deficiency to the City.

ARTICLE 9.04 PARTIAL DEFAULT

In case the City shall declare the Contractor in default as to a part of the work only, the Contractor shall discontinue such part, shall continue performing the remainder of the work in strict conformity with the terms of the Contract, and shall in no way hinder or interfere with any other contractor or person whom the City may engage to complete the work as to which the Contractor was declared in default.

SECTION 10 PAYMENTS

ARTICLE 10.01 PRICES

For the Contractor's complete performance of the work, the City will pay and the Contractor agrees to accept, subject to the terms and conditions hereof, the lump sum prices or unit prices in the Contractor's Proposal and the award made therein, plus the amount required to be paid for any extra work ordered under Article 7.02 hereof, less credit for any work omitted pursuant to Article 7.04 hereof. Under unit price items, the number of units actually required to complete the work under the Contract may be more than stated in the Proposal. The Contractor agrees that no claim will be made for any damages or for loss of profits because of a difference between the quantities of the various classes of work assumed and stated in the Proposal Form as a basis for comparing Proposals and the quantities of work actually performed.

The sum as awarded for any lump sum Contract or lump sum Contract Item shall represent payment in full for all of the various classes of work, including materials, equipment, and labor necessary or required to complete, in conformity with the Contract Document, the entire work shown, indicated or specified under the lump sum Contract or lump sum Contract Item.

The amount as awarded as a unit price for any unit price Contract Item shall represent payment in full for all the materials, equipment, and labor necessary to complete, in conformity with the Contract Documents, each unit of work shown, specified, or required under the said unit price Contract Item.

No payment other than the amount as awarded will be made for any class of work included in a lump sum Contract Item or a unit price Contract Item, unless specific provision is

made therefor in the Contract Documents.

ARTICLE 10.02 SUBMISSION OF BID BREAKDOWN

Within fifteen (15) days after the execution of this Contract, the Contractor must submit to the Engineer in duplicate an acceptable breakdown of the lump sums and unit prices bid for items of the Contract, showing the various operations to be performed under the Contract, as described in the progress schedule required under Article 4.02 hereof, and the value of each of such operations, the total of such items to equal the total price bid. The Contractor shall also submit such other information relating to the bid prices as may be required and shall revise the bid breakdown as directed. Thereafter, the breakdown may be used for checking the Contractor's applications for partial payments hereunder but shall not be binding upon the City or the Engineer for any purpose whatsoever.

ARTICLE 10.03 REPORTS, RECORDS AND DATA

The Contractor shall furnish to the Engineer such schedules of quantities and costs, progress schedules, reports, invoices, delivery tickets, estimates, records, and other data as the Engineer may request concerning work performed or to be performed and the materials furnished under the Contract.

ARTICLE 10.04 PAYMENTS BY CONTRACTOR

The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which such services are rendered, (b) for all materials, tools, and equipment delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors, to the extent of each subcontractor's interest therein; and proof of such payments or releases therefor shall be submitted to the Engineer upon request.

ARTICLE 10.05 PARTIAL PAYMENTS

On or about the first of each month, the Contractor shall make and certify an estimate, on forms prescribed by the City, of the amount and fair value of the work done, and may apply for partial payment therefor. The Contractor shall revise the estimate as the Engineer may direct. When satisfactory progress has been made, and shows that the value of the work completed since the last payment exceeds one percent (1%) of the total Contract price in amount, the Engineer will issue a certificate that such work has been completed and the value thereof. The City will then issue a voucher to the Contractor in accordance with the following schedule:

FOR CONTRACT AMOUNTS UNDER \$250,000

(A) In the amount of ninety percent (90%) of the value of the work completed as certified until construction is one hundred percent (100%) complete (operational or beneficial occupancy), the withheld amount may be reduced below ten percent (10%), at the Engineer's option, to only that amount necessary to assure completion.

FOR CONTRACT AMOUNTS OVER \$250,000

(A) In the amount of ninety percent (90%) of the value of the work completed as certified until construction is fifty percent (50%) complete.

(B) When the dollar value, as determined by the Engineer, of satisfactorily completed work in place is greater than fifty percent (50%) of the original contract price, vouchers for partial payment will be issued by the City to the Contractor in the amount of one hundred percent (100%) of the value of the work, above 50%, completed as certified for that payment period.

(C) If the Contractor has performed satisfactorily and the work is substantially complete (operational or beneficial occupancy) the withheld amount may be reduced, at the Engineer's option, to only that amount necessary to assure completion.

In addition to the Conditions set forth in (A), (B), and (C) above, payments will always be less any sums that may be retained or deducted by the City under the terms of any of the contract documents and less any sums that may be retained to cover monetary guarantees for equipment, materials or progress performance.

Payment on estimates made on or about the first of the month may be expected on or about the 20th of the month.

Unless specified otherwise in the Contract Items, the delivered cost of equipment and nonperishable materials suitably stored at the site of the work and tested for adequacy may be included in the Contractor's application for partial payment provided, however, that the Contractor shall furnish evidence satisfactory to the City that the Contractor is the unconditional owner and in possession of such materials or equipment. The amount to be paid will be 90 percent of the invoice cost to the Contractor which cost shall be supported by receipted bills within 30 days of the date of payment by the City to the Contractor. Such payment shall not relieve the Contractor from full responsibility for completion of the work and for protection of such materials and equipment until incorporated in the work in a permanent manner as required by the Contract Documents.

Before any payment will be made under this Contract, the Contractor and every subcontractor, if required, shall deliver to the Engineer a written, verified statement, in satisfactory form, showing in detail all amounts then due and unpaid by such Contractor or subcontractor to all laborers, workmen, and mechanics, employed by him under the Contract for the performance of the work at the site thereof, for daily or weekly wages, or to other persons for materials, equipment, or supplies delivered at the site of the work during the period covered by the payment under consideration.

ARTICLE 10.06 FINAL PAYMENT

Under determination of satisfactory completion of the work under this Contract as provided in Article 4.07 hereof, the Engineer will prepare the final estimate showing the value of the completed work. This estimate will be prepared within 30 days after the date of completion or as soon thereafter as the necessary measurements and computations can be made.

All prior certificates and estimates, being approximate only, are subject to correction in the final estimate and payment.

When the final estimate has been prepared and certified by Engineer, he will submit to the Mayor and City Council the final certificate stating that the work has been completed and the amount based on the final estimate remaining due to the Contractor. The City will then accept the work as fully completed and will, not later than 30 days after the final acceptance, as defined in Article 1.02, of the work done under this Contract, pay the Contractor the entire amount so found due thereunder after deduction of all previous payments and all percentages and amounts to be kept and retained under provisions of this Contract; provided, however, and it is understood and agreed that, as a precedent to receiving final payment, the Contractor shall submit to the City a sworn affidavit that all bills for labor, service, materials, and subcontractors have been paid and that there are no suits pending in connection with this work. The City, at its option, may permit the Contractor to execute a separate surety bond in a form satisfactory to the City. The surety bond shall be in the full amount of the suit or suits.

Neither the final payment nor any part of the retained percentage shall be paid until the Contractor, if required, shall furnish the City with a complete release from any should remain unsatisfied after all payments are made, the Contractor shall refund to the City all monies which the City may be compelled to pay in discharging such claim, including incidental costs and attorney's fees.

ARTICLE 10.07 ACCEPTANCE OF FINAL PAYMENT

The acceptance by the Contractor, or by anyone claiming by or through him, of the final payment shall operate as and shall be a release to the City and every officer and agent thereof from any and all claims and liability to the Contractor for anything done or furnished in connection with the work or project and for any act or neglect of the Contractor or of any others relating to or affecting the work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this Contract or the Performance Bond.

SECTION 11 MISCELLANEOUS PROVISIONS

ARTICLE 11.01 CONTRACTOR'S WARRANTIES

In consideration of, and to induce the award of this contract to him, the Contractor represents and warrants:

- (a) That he is not in arrears to the City upon debt or contract, and he is not a defaulter, as surety, contractor, or otherwise.
- (b) That he is financially solvent and sufficiently experienced and competent to perform the work.
- (c) That the work can be performed as called for by the Contract Documents.
- (d) That the facts stated in his proposal and the information given by him are true and correct in all respects.
- (e) That he is fully informed regarding all the conditions affecting the work to be done and labor and materials to be

furnished for the completion of this Contract, and that his information was secured by personal investigation and research.

ARTICLE 11.02 PATENTED DEVICES, MATERIAL AND PROCESSES

It is mutually understood and agreed that Contract prices include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work. Whenever the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall indemnify and save harmless the City, its officers, agents and employees from any and all claims for infringement by reason of the use of any such patented design, device, tool, material, equipment, or process, to be performed under the Contract, and shall indemnify the said City, its officers, agents, and employees for any costs, expenses, and damages which may be incurred by reason of such infringement at any time during the prosecution or after completion of the work.

ARTICLE 11.03 SUITS AT LAW

In case any action at law or suit in equity may or shall be brought against the City or any of its officers, agents, or employees for or on account of the failure, omission, or neglect of the Contractor or his subcontractors, employees, or agents, to do or perform any of the covenants, acts, matters, or things by this Contract undertaken to be done or performed by the Contractor or his subcontractors, employees, or agents, or from any injuries done to property or persons and caused by the negligence or alleged negligence of the Contractor or his subcontractors, employees, or agents, or in any other manner arising out of the performance of this Contract, then the Contractor shall immediately assume and take charge of the defense of such actions or suits in like manner and to all intents and purposes as if said actions or suits have been brought directly against the Contractor, and the Contractor shall also indemnify and save harmless the City, its officers, agents, and employees from any and all loss, cost or damage whatever arising out of such actions or suits, in like manner and to all intents and purposes as if said actions or suits have been brought directly against the Contractor.

The Contractor shall and does hereby assume all liability for and agrees to indemnify the City or its Engineer against any or all loss, costs, damages, and liability for any or by reason of any lien, claims or demands, either for materials purchased or for work performed by laborers, mechanics, and others and from any damages, costs, actions, or causes of action and judgement arising from injuries sustained by mechanics, laborers, or other persons by reason of accidents or otherwise, whether caused by the carelessness or inefficiency or neglect of said Contractor, his subcontractors, agents, employees, workmen or otherwise.

ARTICLE 11.04 CLAIMS FOR DAMAGES

If the Contractor shall claim compensation for any damage sustained, other than for extra or disputed work covered by Article 7.02 and 7.03 hereof, by reason of any act or omission of the City, its agents, or any persons, he shall, within five days after sustaining such damage, make and

deliver to the Engineer a written statement of the nature of the damage sustained and of the basis of the claim against the City. On or before the 15th of the month succeeding that in which any damage shall have been sustained, the Contractor shall make and deliver to the Engineer an itemized statement of the details and amounts of such damage, duly verified by the Contractor. Unless such statements shall be made delivered within the times aforesaid, it is stipulated that and all claims for such compensation shall be forfeited and invalidated, and the Contractor shall not be entitled to payment on account of such claims.

ARTICLE 11.05 NO CLAIMS AGAINST INDIVIDUALS

No claim whatsoever shall be made by the Contractor against any officer, agent, employee of the City for, or on account of, anything done or omitted to be done in connection with this Contract.

ARTICLE 11.06 LIABILITY UNAFFECTED

Nothing herein contained shall in any manner create any liability against the City on behalf of any claim for labor, services, or materials, or of subcontractors, and nothing herein contained shall affect the liability of the Contractor or his sureties to the City or to any workmen or materialsmen upon bond given in connection with this Contract.

ARTICLE 11.07 INDEMNIFICATION PROVISIONS

Whenever there appears in this Agreement, or in the other Contract Documents made a part hereof, an indemnification provision within the purview of Chapter 725.06, Laws of Florida, the monetary limitation on the extent of the indemnification under each such provision shall be One Million Dollars or a sum equal to the total Contract price, whichever shall be the greater.

ARTICLE 11.08 UNLAWFUL PROVISIONS DEEMED STRICKEN

If this contract contains any unlawful provisions not an essential part of the Contract and which shall not appear to have a controlling or material inducement to the making thereof, such provisions shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the Contract without affecting the binding force of the remainder.

ARTICLE 11.09 LEGAL PROVISIONS DEEMED INCLUDED

Each and every provision of any law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein and if, through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon application of either party the Contract shall forthwith be physically amended to make such insertion.

ARTICLE 11.10 DEATH OR INCOMPETENCY OF CONTRACTOR

In the event of death or legal incompetency of a Contractor who shall be an individual or surviving member of a contracting firm, such death or adjudication of incompetency

shall not terminate the Contract, but shall act as default hereunder to the effect provided in Article 9.01 hereof and the estate of the Contractor and his surety shall remain liable hereunder to the same extent as though the Contractor had lived. Notice of default, as provided in Article 9.01 hereof, shall not be required to be given in the event of such death or adjudication of incompetency.

ARTICLE 11.11 NUMBER AND GENDER OF WORDS

Whenever the context so admits or requires, all references herein in one number shall be deemed extended to and including the other number, whether singular or plural, and the use of any gender shall be applicable to all genders.

ARTICLE 11.12 ACCESS TO RECORDS

Representatives of Federal Agencies, if applicable, and the State of Florida shall have access to the work whenever it is in preparation of progress. On federally assisted projects the Federal Agency, the Comptroller General of the United States, or any authorized representative shall have access to any books, documents, papers, and records of the Contractor which are pertinent to the project for the purpose of making audit, examination, excerpts, and transcription thereof.

**SECTION 12
LABOR STANDARDS**

ARTICLE 12.01 LABOR STANDARDS

The Contractor shall comply with all of the regulations set forth in "Labor Standards Provisions for Federally Assisted Construction Contracts", which may be attached, and any applicable Florida Statutes.

ARTICLE 12.02 NOTICE TO LABOR UNIONS

If required, the Contractor shall provide Labor Unions and other organizations of workers, and shall post, in a conspicuous place available to employees or applicants for employment, a completed copy of the form entitled "Notice to Labor Unions or Other Organizations of Workers" attached to and made a part of this Agreement.

ARTICLE 12.03 SAFETY AND HEALTH REGULATIONS

The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91- 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54). Nothing in these Acts shall be construed to supersede or in any manner affect any worker's compensation law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of, or in the course of, employment.

ARTICLE 12.04 EEO AFFIRMATIVE ACTION REQUIREMENTS

The Contractor understands and agrees to be bound by the equal opportunity requirements of Federal regulations which shall be applicable throughout the performance of work under this Contract. The Contractor also agrees to similarly

bind contractually each subcontractor. In policies, the Contractor agrees to engage in Affirmative Action directed at promoting and ensuring equal employment opportunity in the work force used under the Contract (and the Contractor agrees to require contractually the same effort of all subcontractors whose subcontractors exceed \$100,000). The Contractor understands and agrees that "Affirmative Action" as used herein shall constitute a good faith effort to achieve and maintain minority employment in each trade in the on-site work force used on the Contract.

ARTICLE 12.05 PREVAILING RATES OF WAGES

Florida's prevailing wage law was repealed effective April 25, 1979.

For Federally assisted projects, appropriate prevailing wage rate determinations are indicated on pages beginning with WR-1.

* * * * *

IN WITNESS THEREOF, the parties have hereunto set their hands and seals, and such of them as are corporation have caused these present to be signed by their duly authorized officers.

CITY OF TAMPA, FLORIDA

Jane Castor, Mayor
(SEAL)

ATTEST:

City Clerk

Approved as to Form:
The execution of this document was authorized
by Resolution No. _____

Justin R. Vaske, Assistant City Attorney

Contractor

By: _____
(SEAL)

Title:

ATTEST:

Witness

TAMPA AGREEMENT (ACKNOWLEDGMENT OF PRINCIPAL)

STATE OF _____)
) SS:
COUNTY OF _____)

For a Corporation:

STATE OF _____
COUNTY OF _____

The forgoing instrument was Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____, 2020, by _____ as _____ of _____, a/n Partnership Joint Venture LLC Corp Other: _____, on behalf of such entity. Such individual is Personally Known OR Produced Identification. Type of Identification Produced _____.

[NOTARY SEAL]

Notary Public, State of _____
Notary Printed Name: _____
Commission No.: _____
My Commission Expires: _____

For an Individual:

STATE OF _____
COUNTY OF _____

The forgoing instrument was Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____, 2020, By _____, Such individual is Personally Known OR Produced Identification. Type of Identification Produced: _____.

[NOTARY SEAL]

Notary Public, State of _____
Notary Printed Name: _____
Commission No.: _____
My Commission Expires: _____

For a Firm:

STATE OF _____
COUNTY OF _____

The forgoing instrument was Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____, 2020, by _____ as _____ of _____, a/n Partnership Joint Venture LLC Corp Other: _____, on behalf of such entity. Such individual is Personally Known OR Produced Identification. Type of Identification Produced _____.

[NOTARY SEAL]

Notary Public, State of _____
Notary Printed Name: _____
Commission No.: _____
My Commission Expires: _____

PUBLIC CONSTRUCTION BOND

Bond No. (enter bond number) _____

Name of Contractor: _____

Principal Business Address of Contractor: _____

Telephone Number of Contractor: _____

Name of Surety (if more than one list each): _____

Principal Business Address of Surety: _____

Telephone Number of Surety: _____

Owner is The City of Tampa, Florida

Principal Business Address of Owner: _____ 306 E Jackson St, Tampa, FL 33602

_____ Contract Administration Department (280A4N)

Telephone Number of Owner: _____ 813/274-8456

Contract Number Assigned by City to contract which is the subject of this bond: _____

Legal Description or Address of Property Improved or Contract Number is: _____

General Description of Work and Services: _____

KNOW ALL MEN BY THESE PRESENTS That we, _____

(Name of Contractor)

as Principal, hereinafter called CONTRACTOR, of the State of _____, and

(Name of Surety)

a corporation organized and existing under and by virtue of the laws of the State of _____, and regularly authorized to do business in the State of Florida, as SURETY, are held and firmly bound unto the City of Tampa, a municipal corporation organized and existing under the laws of the State of Florida, hereinafter called Owner, in the penal sum of _____ Dollars and _____ Cents (\$ _____), lawful money of the United States of America, for the payment whereof well and truly to be made, we bind ourselves, our heirs, executors, and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract dated _____, _____, 20____, between Principal and Owner for construction of _____, the contract being made a part of this bond by reference, in the time and in the manner prescribed in the contract; and
2. Promptly makes payments to all claimants, as defined in Section 255.05(1) (Section 713.01), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and
3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the contract; and
4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.
5. Contractor and Surety acknowledge that the Work for which this bond has been issued may be one of several such contract documents for a group of projects. This bond does not secure covenants to pay for or to perform design services survey or program management services. The Owner/Obligee is expected to reasonably account for damages that are caused to Owner with respect to Principal's (Contractor's) default in performance of the scope of the Work incorporated by reference into the bond, and notwithstanding any contractual or common law remedy permitted to Owner as against Contractor, the obligation of Surety for any damages under this bond shall be determined by the cost of completion of the Work less the contract balance unpaid upon default of Contractor for the Work plus liquidated damages at the rate of \$500.00 per day for delays by the Contractor and/or Surety in reaching substantial completion.
6. The notice requirements for claimants and conditions for entitlement to payment set forth in Section 255.05, Fla. Stat. and the limitations period to actions upon Section 255.05, Fla. Stat. bonds apply to claimants seeking payment from surety under this bond. Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05, Florida Statutes.
7. The Surety, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the contract documents or other Work to be performed hereunder, or the specifications referred to therein shall in any way affect its obligations under this bond, and it does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to Work or to the specifications.

8. The above SURETY states that it has read all of the Contract Documents made by the CONTRACTOR with the CITY, hereto attached, and the terms and conditions of the contract and work, and is familiar therewith and in particular those portions of the Agreement concerning the guaranty of such CONTRACTOR for a period of one year following the date of the final acceptance of the completed work under the Contract by the CITY, all of which this BOND includes.

DATED ON _____, 20__

(Name of Principal)

(Name of Surety)

(Principal Business Address)

(Surety Address)

By _____

By _____
(As Attorney in Fact)*

Title _____

Telephone Number of Surety

Telephone Number of Principal

Approved as to legal sufficiency:

Countersignature:

By _____
Assistant City Attorney

(Name of Local Agency)

(Address of Resident Agent)

By _____

Title _____

Telephone Number of Local Agency

*(As Attorney in Fact) attach Power of Attorney and Current Certificate with Original Signature

SPECIFICATIONS GENERAL PROVISIONS

SECTION 1 SCOPE AND INTENT

G-1.01 DESCRIPTION

The work to be done consists of the furnishing of all labor, materials and equipment, and the performance of all work included in this Contract.

G-1.02 WORK INCLUDED

The Contractor shall furnish all labor, superintendence, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all required permits. He shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

The cost of incidental work described in these General Provisions, for which there are no specific Contract Items, shall be considered as part of the overhead cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefor.

The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his plant and equipment, prior approval of the Engineer notwithstanding.

G-1.03 PUBLIC UTILITY INSTALLATIONS AND STRUCTURES

Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the City, other governmental bodies or privately owned by individuals, firms, or corporations, and used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water or other public or private property which may be affected by the work.

The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make his own investigations to inform himself

fully of the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.

The Contractor shall protect all public utility installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means approved by the Engineer. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor which are shown on the Plans or have been located in the field by the utility shall be repaired by the Contractor, at his expense, as directed by the Engineer. No separate payment shall be made for such protection or repairs to public utility installations or structures.

Public utility installations or structures owned or controlled by the City or other governmental body which are shown on the Plans to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as a part of the general cost of doing the work and shall be included in the prices bid for the various Contract Items. No separate payment shall be made therefor.

Where public utility installations or structures owned or controlled by the City or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction or such work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided for in Article 7.02 of the Agreement.

The Contractor shall, at all times in performance of the work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public utility installations and structures; and shall, at all times in the performance of the work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.

All City and other governmental utility departments and other owners of public utilities, which may be affected by the work, will be informed in writing by the Engineer within two weeks after the execution of the Contract or Contracts covering the work. Such notice will set out, in general, and direct attention to, the responsibilities of the City and other governmental

utility departments and other owners of public utilities for such installations and structures as may be affected by the work and will be accompanied by one set of Plans and Specifications covering the work under such Contract or Contracts.

In addition to the general notice given by the Engineer, the Contractor shall give written notice to all City and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight (48) hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Underground Utility Notification Center for Excavators (Call Candy)".

The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the Engineer.

SECTION 2 PLANS AND SPECIFICATIONS

G-2.01 PLANS

The Plans referred to in the Contract Documents bear the general project name and number as shown in the Notice To Bidders.

When obtaining data and information from the Plans, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

G-2.02 COPIES FURNISHED TO CONTRACTOR

After the Contract has been executed, the Contractor will be furnished with five sets of paper prints, the same size as the original drawings, of each sheet of the Plans and five copies of the Specifications. Additional copies of the Plans and Specifications, when requested, may be furnished to the Contractor at cost of reproduction.

The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as may be required for his work.

G-2.03 SUPPLEMENTARY DRAWINGS

When, in the opinion of the Engineer, it becomes necessary to explain more fully the work to be done or to illustrate the work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer and five paper prints thereof will be given to the Contractor.

The Supplementary Drawings shall be binding upon the Contractor with the same force as the Plans. Where such Supplementary Drawings require either less or more than the estimated quantities of work, credit to the City or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

G-2.04 CONTRACTOR TO CHECK PLANS AND DATA

The Contractor shall verify all dimensions, quantities, and details shown on the Plans, Supplementary Drawings, Schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions as full instructions will be furnished by the Engineer, should such errors or omissions be discovered. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

G-2.05 SPECIFICATIONS

The specifications consist of four parts, the General Provisions, the Technical Specifications, the Special Provisions and the Contract Items. The General Provisions and Technical Specifications contain general requirements which govern the work. The Special Provisions and the Contract Items modify and supplement these by detailed requirements for the work and shall always govern, whenever there appears to be conflict.

G-2.06 INTENT

All work called for in the Specifications applicable to this Contract, but not shown on the Plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

SECTION 3 WORKING DRAWINGS

G-3.01 SCOPE

The Contractor shall promptly prepare and submit layout, detail and shop drawings to insure proper construction, assembly, and installation of the work using those materials and methods as hereafter specified under the Technical Specifications, Special Provisions and Contract Items.

These drawings shall accurately and distinctly present the following:

- a. All working and erection dimensions.
- b. Arrangements and sectional views.
- c. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
- d. Kinds of materials and finishes.
- e. Parts listed and description thereof.

Drawings for mechanical equipment shall present, where applicable, such data as dimensions, weight and performance characteristics. These data shall show conformance with the performance characteristics and other criteria incorporated in the Plans and Specifications.

Each drawing shall be dated and shall contain the name of the project, Division number and description, the technical specifications section number, names of equipment or materials and the location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material. The Engineer will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

The Contractor shall review all working drawing submittals before transmitting them to the Engineer to determine that they comply with requirements of the Specifications. Drawings which are incomplete or are not in compliance with the Contract Documents shall not be submitted for processing by the Engineer. The Contractor shall place his stamp of approval on all working drawings submitted to the Engineer to indicate compliance with the above.

G-3.02 APPROVAL

If the working drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of submittal; otherwise approval of such submittals shall not constitute approval of the departure. Approval of the drawings shall constitute approval of the subject matter thereof only and not of any structure, material, equipment, or apparatus shown or indicated.

The approval of drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract and not indicated on the drawings. No work called for by working drawings shall be done until such drawings have been approved by the Engineer.

The procedure in seeking approval of the working drawings shall be as follows:

1. The Contractor shall submit four complete sets of drawings

and other descriptive data together with one copy of a letter of transmittal to the Engineer for approval. The letter of transmittal shall contain the name of the project, contract number, technical specifications section number, the name of the Contractor, a list of drawings with numbers and titles, and any other pertinent information.

2. Drawings or descriptive data will be stamped "Approved", "Approved Subject to Corrections Marked", or "Examined and Returned for Correction" and one copy with a letter of transmittal will be returned to the Contractor.

3. If a drawing or other data is stamped "Approved", the Contractor shall insert the date of approval on five additional copies of the document and transmit the five copies to the Engineer together with one copy of a letter of transmittal containing substantially the same information as described in Instruction 1. above.

4. If a drawing or other data is stamped "Approved Subject to Corrections Marked", the Contractor shall make the corrections indicated and proceed as in Instruction 3., above.

5. If a drawing or data is stamped "Examined and Returned for Correction", the Contractor shall make the necessary corrections and resubmit the documents as set forth in Instruction 1., above. The letter of transmittal shall indicate that this is a resubmittal.

The Contractor shall revise and resubmit the working drawings as required by the Engineer, until approval thereof is obtained.

SECTION 4 MATERIALS AND EQUIPMENT

G-4.01 GENERAL REQUIREMENTS

All materials, appliances, and types or methods of construction shall be in accordance with the Specifications and shall, in no event, be less than that necessary to conform to the requirements of any applicable laws, ordinances, and codes.

All materials and equipment shall be new, unused, and correctly designed. They shall be of standard first grade quality, produced by expert personnel, and intended for the use for which they are offered. Materials or equipment which, in the opinion of the Engineer, are inferior or of a lower grade than indicated, specified, or required will not be accepted.

The quality of Workmanship and Materials entering into the work under this Contract shall conform to the requirements of the pertinent sections, clauses, paragraphs, and sentences, both directly and indirectly applicable thereto, of that part of the Technical Specifications, whether or not direct reference to such occurs in the Contract Items.

Equipment and appurtenances shall be designed in conformity with ANSI, ASME, IEEE, NEMA and other

generally accepted standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operation. All bearings and moving parts shall be adequately protected against wear by bushings or other approved means and shall be fully lubricated by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, and the like, shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.

Equipment shall be of the approximate dimensions as indicated on the Plans or as specified, shall fit the spaces shown on the Plans with adequate clearances, and shall be capable of being handled through openings provided in the structure for this purpose. The equipment shall be of such design that piping and electrical connections, ductwork, and auxiliary equipment can be assembled and installed without causing major revisions to the location or arrangement of any of the facilities.

Machinery parts shall conform exactly to the dimensions shown on the working drawings. There shall be no more fitting or adjusting in setting up a machine than is necessary in assembling high grade apparatus of standard design. The equivalent parts of identical machines shall be made interchangeable. All grease lubricating fittings on equipment shall be of a uniform type. All machinery and equipment shall be safeguarded in accordance with the safety codes of the ANSI and applicable state and local codes.

G-4.02 MANUFACTURER

The names of proposed manufacturers, suppliers, material, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for approval, as early as possible, to afford proper investigation and checking. Such approval must be obtained before shop drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. He shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.

Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

G-4.03 REFERENCE TO STANDARDS

Whenever reference is made to the furnishing of materials or

testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for proposals, even though reference has been made to an earlier standard, and such standards are made a part hereof to the extent which is indicated or intended.

Reference to a technical society, organization or body may be made in the Specifications by abbreviations, in accordance with the following list:

AASHTO for American Association of State Highway and Transportation Officials (formerly AASHO)
ACI for American Concrete Institute
AGMA for American Gear Manufacturer's Association
AFBMA for Anti-Friction Bearing Manufacturer's Association
AISC for American Institute of Steel Construction
AISI for American Iron and Steel Institute
ANSI for American National Standards Institute
ASCE for American Society of Civil Engineers
ASTM for American Society for Testing and Materials
ASME for American Society of Mechanical Engineers
AWS for American Welding Society
AWWA for American Water Works Association
AWPA for American Wood Preservers Association
CEMA for Conveyor Equipment Manufacturers Association
CIPRA for Cast Iron Pipe Research Association
IEEE for Institute of Electrical and Electronic Engineers
IPCEA for Insulated Power Cable Engineers Association
NEC for National Electrical Code
NEMA for National Electrical Manufacturers Association
SAE for Society of Automotive Engineers
SHBI for Steel Heating Boiler Institute
Fed.Spec. for Federal Specifications
Navy Spec. for Navy Department Specifications
U.L.,Inc. for Underwriters' Laboratories, Inc.

When no reference is made to a code, standard or specification, the Standard Specifications of the ANSI, the ASME, the ASTM, the IEEE, or the NEMA shall govern.

G-4.04 SAMPLES

The Contractor shall, when required, submit to the Engineer for approval typical samples of materials and equipment. The samples shall be properly identified by tags and shall be submitted sufficiently in advance of the time when they are to be incorporated into the work, so that rejections thereof will not cause delay. A letter of transmittal, in duplicate, from the Contractor requesting approval must accompany all such samples.

G-4.05 EQUIVALENT QUALITY

Whenever, in the Contract Documents, an article, material, apparatus, equipment, or process is called for by trade name or by the name of a patentee, manufacturer, or dealer or by reference to catalogs of a manufacturer or dealer, it shall be understood as intending to mean and specify the article, material, apparatus, equipment or process designated, or any

equal thereto in quality, finish, design, efficiency, and durability and equally serviceable for the purposes for which it is intended.

Whenever material or equipment is submitted for approval as being equal to that specified, the decision as to whether or not such material or equipment is equal to that specified shall be made by the Engineer.

Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract, the Contractor shall immediately proceed to furnish the designated material or equipment.

Neither the approval by the Engineer of alternate material or equipment as being equivalent to that specified nor the furnishing of the material or equipment specified, shall in any way relieve the Contractor of responsibility for failure of the material or equipment, due to faulty design, material, or workmanship, to perform the functions required of them by the Specifications.

G-4.06 DELIVERY

The Contractor shall deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete the work within the allotted time. The Contractor shall also coordinate deliveries in order to avoid a delay in, or impediment of, the progress of the work of any related Contractor.

G-4.07 CARE AND PROTECTION

The Contractor shall be solely responsible for properly storing and protecting all materials, equipment, and work furnished under the Contract from the time such materials and equipment are delivered at the site of the work until final acceptance thereof. He shall, at all times, take necessary precautions to prevent injury or damage by water, freezing, or by inclemencies of the weather to such materials, equipment and work. All injury or damage to materials, equipment, or work resulting from any cause whatsoever shall be made good by the Contractor.

The Engineer shall, in all cases, determine the portion of the site to be used by the Contractor for storage, plant or for other purposes. If, however, it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the work or interference with the work to be done by any other Contractor, the Contractor shall remove and restack such materials at his own expense.

G-4.08 TOOLS AND ACCESSORIES

The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

Spare parts shall be furnished as specified.

Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rating data.

G-4.09 INSTALLATION OF EQUIPMENT

The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.

Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the Engineer during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.

The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the Engineer and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.

The Contractor shall, at his own expense, furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations. Grout shall completely fill the space between the equipment base and the foundation.

G-4.10 OPERATING INSTRUCTIONS

The Contractor, through qualified individuals, shall adequately instruct designated employees of the City in the operation and care of all equipment installed hereunder, except for equipment that may be furnished by the City.

The Contractor shall also furnish and deliver to the Engineer three complete sets for permanent files, identified in accordance with Subsection G-3.01 hereof, of instructions, technical bulletins and any other printed matter, such as diagrams, prints or drawings, containing full information required for the proper operation, maintenance, and repair, of the equipment installed and the ordering of spare parts, except for equipment that may be furnished by the City.

In addition to the above three copies, the Contractor shall furnish any additional copies that may be required for use during construction and start-up operations.

G-4.11 SERVICE OF MANUFACTURER'S ENGINEER

The Contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in

permanent operation by the City, such engineer or superintendent shall make all adjustments and tests required by the Engineer to provide that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the City in the proper operation and maintenance of such equipment.

SECTION 5 INSPECTION AND TESTING

G-5.01 GENERAL

The Contractor's attention is hereby directed to Article 3.03 of the Agreement.

Inspection and testing of materials will be performed by the City unless otherwise specified.

For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Five copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract, the Contractor will be notified thereof and he will be directed to refrain from delivering said material and equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the City.

Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the City formally takes over the operation thereof.

G-5.02 COSTS

All inspection and testing of materials furnished under this Contract will be performed by the City or duly authorized inspection engineers or inspection bureaus without cost to the Contractor, unless otherwise expressly specified.

The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the contract price.

Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the City for compliance. The Contractor shall reimburse the City for the expenditures incurred in making

such tests on materials and equipment which are rejected for noncompliance.

G-5.03 INSPECTIONS OF MATERIALS

The Contractor shall give notice, in writing to the Engineer, sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice the Engineer will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or he will notify the Contractor that inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived. The Contractor must comply with these provisions before shipping any material. Such inspection shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

G-5.04 CERTIFICATE OF MANUFACTURE

When inspection is waived or when the Engineer so requires, the Contractor shall furnish to him authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

G-5.05 SHOP TESTS OF OPERATING EQUIPMENT

Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the work until the Engineer notifies the Contractor, in writing, that the results of such tests are acceptable.

Five copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be forwarded to the Engineer for approval.

The cost of the shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

G-5.06 PRELIMINARY FIELD TESTS

As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make preliminary field tests of equipment. If the preliminary field tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to the acceptance tests, make all changes, adjustments, and replacements required.

TEMPORARY STRUCTURES

G-5.07 FINAL FIELD TESTS

Upon completion of the work and prior to final payment, all equipment and appliances installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contract Documents.

The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment, and instruments necessary for all acceptance tests, at no additional cost to the City.

G-5.08 FAILURE OF TESTS

Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to make those corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees or specified requirements, the City, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the Contractor to remove them from the site at his own expense.

In case the City rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the City may, after the expiration of a period of thirty calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under this Contract.

The City agrees to obtain other equipment within a reasonable time and the Contractor agrees that the City may use the equipment furnished by him without rental or other charges until the new equipment is obtained.

Materials or work in place that fails to pass acceptability tests shall be retested at the direction of the construction engineer all such retests shall be at the Contractor's expense. The rates charged shall be in accordance with the Department of Public Works current annual inspection contract which is available for inspection at the offices of the Department of Public Works.

G-5.09 FINAL INSPECTION

The procedures for final inspection shall be in accordance with the provisions of Article 4.07 of the Agreement. During such final inspections, the work shall be clean and free from water. In no case will the final estimate be prepared until the Contractor has complied with all the requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

SECTION 6

G-6.01 GENERAL

All false work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles, roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the work and which are not herein described or specified in detail, must be furnished, maintained and removed by the Contractor, and he shall be responsible for the safety and efficiency of such works and for any damages that may result from their failure or from their improper construction, maintenance, or operation.

G-6.02 PUBLIC ACCESS

At all points in the work where public access to any building, house, place of business, public road, or sidewalk would be obstructed by any action of the Contractor in executing the work required by this Contract, the Contractor shall provide such temporary structure, bridges or roadway as may be necessary to maintain public access at all times. At least one lane for vehicular traffic shall be maintained in streets in which the Contractor is working. Street closure permits are required from the Department of Public Works.

The Contractor shall provide suitable temporary bridges, as directed by the Engineer, at street intersections when necessary for the maintenance of vehicular and pedestrian traffic.

Prior to temporarily cutting of access to driveways and garages, the Contractor shall give twelve (12) hours notice to affected property owners. Interruptions to use of private driveways shall be kept to a minimum.

G-6.03 CONTRACTOR'S FIELD OFFICE

The Contractor shall erect, furnish and maintain a field office with a telephone at the site during the entire period of construction. He or an authorized agent shall be present at this office at all times while his work is in progress. Readily accessible copies of both the Contract Documents and the latest approved working drawings shall be kept at this field office.

G-6.04 TEMPORARY FENCE

If, during the course of the work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall, at his own expense, if so ordered by the Engineer, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced. The Engineer shall be solely responsible for the determination of the necessity for providing a temporary fence and the type of temporary fence to be used.

G-6.05 RESPONSIBILITY FOR TEMPORARY STRUCTURES

In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance, or operation and will indemnify and save harmless the City from

all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

SECTION 7 TEMPORARY SERVICES

G-7.01 WATER

The Contractor shall provide the necessary water supply at his own expense. He shall, if necessary, provide and lay necessary waterlines from existing mains to the place of using, shall secure all necessary permits and pay for all taps to water mains or hydrants and for all water used at the established rates.

G-7.02 LIGHT AND POWER

The Contractor shall provide, at his own expense, temporary lighting and power facilities required for the proper prosecution and inspection of the work. If, in the opinion of the Engineer, these facilities are inadequate, the Contractor will not be permitted to proceed with any portion of the work affected thereby.

G-7.03 SANITARY REGULATIONS

The Contractor shall prohibit and prevent the committing of nuisances on the site of the work or on adjoining property and shall discharge any employee who violates this rule.

Ample washrooms and toilet facilities and a drinking water supply shall be furnished and maintained in strict conformity with the law by the Contractor for use by his employees.

G-7.04 ACCIDENT PREVENTION

Precautions shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. The Contractor shall comply with the U. S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596), and under Section 107 of the Contract Work. Hours and Safety Standards Act (PL 91-54), except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor in accordance with provisions of the Occupational Safety and Health Act.

G-7.05 FIRST AID

The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when men are employed on the work.

G-7.06 HEATING

The Contractor shall provide temporary heat, at his own expense, whenever required on account of work being carried on during cold weather and to prevent freezing of water pipes and other damage to the work.

SECTION 8

LINES AND GRADES

G-8.01 GENERAL

All work done under this Contract shall be constructed in accordance with the lines and grades shown on the Plans, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

The Engineer will establish bench marks and base line controlling points. Reference remarks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the use of the reference marks provided. He shall remove any obstructions placed by him contrary to this provision.

G-8.02 SURVEYS

The Contractor shall furnish and maintain, at his own expense, stakes and other such materials, and give such assistance, including qualified helpers, as may be required by the Engineer for setting reference marks. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review of the Engineer.

The Contractor shall keep the Engineer informed a reasonable time in advance as to his need for line and grade reference marks, in order that they may be furnished and all necessary measurements made for record and payment with the minimum of inconvenience to the Engineer or of delay to the Contractor.

It is the intention not to delay the work for the establishment of reference marks but, when necessary, working operations shall be suspended for such reasonable time as the Engineer may require for this purpose.

G-8.03 SAFEGUARDING MARKS

The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.

The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

G-8.04 DATUM PLANE

All elevations indicated or specified refer to the Mean Sea Level Datum of the U.S.C. & G.S. (N.O.S.) which is 0.80 feet above the Mean Low Water Datum of the U. S. Army

Corps of Engineers.

SECTION 9 ADJACENT STRUCTURES AND LANDSCAPING

G-9.01 RESPONSIBILITY

The responsibility for removal, replacement, relocation, repair, rebuilding or protection of all public utility installations, including poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes, sewers, traffic control and fire alarm signal circuit installations and other appurtenances and facilities shall be in accordance with G-1.02 and G-1.03.

The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation, and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payment will be made therefor. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the Engineer, removal or relocation and reconstruction is necessary to avoid interference with the work, payment therefor will be made as provided for extra work in Article 7.02 of the Agreement.

G-9.02 PROTECTION OF TREES

All trees and shrubs shall be adequately protected by the Contractor with boxes or otherwise and, within the City of Tampa, in accordance with ordinances governing the protection of trees. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by him with new stock of similar size and age, at the proper season, and at the sole expense of the Contractor.

Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.

The City may order the Contractor, for the convenience of the City, to remove trees along the line of trench excavation. If so ordered, the City will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

G-9.03 LAWN AREAS

Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed and later replaced, or the area where sod has been removed shall be restored with new sod in the

manner described in the Technical Specifications section.

G-9.04 RESTORATION OF FENCES

Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the approval of the Engineer. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or Items, or if no specific Item is provided therefor, as part of the overhead cost of the work, and no additional payment will be made therefor.

SECTION 10 PROTECTION OF WORK AND PUBLIC

G-10.01 TRAFFIC REGULATIONS

The Contractor shall arrange his work to comply with Article G-6.02. The work shall be done with the least possible inconvenience to the public and to that end the work may be confined by the Engineer to one block at a time.

G-10.02 BARRIERS AND LIGHTS

During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers, and lights, as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public. Such barriers and signs shall be constructed to State of Florida Department of Transportation standards and placed as recommended by the Traffic Division of the City's Department of Public Works.

No open fires will be permitted.

G-10.03 SMOKE PREVENTIONS

The Contractor shall use hard coal, coke, oil or gas as fuel for equipment generating steam. A strict compliance with ordinances regulating the production and emission of smoke will be required.

G-10.04 NOISE

The Contractor shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.

Except in the event of an emergency, no work shall be done between the hours of 7:00 p.m. and 7:00 a.m., or on Sundays.

If the proper and efficient prosecution of the work requires operations during the night, the written permission of the Engineer shall be obtained before starting such items of the work.

**SECTION 13
CLEANING**

G-10.05 ACCESS TO PUBLIC SERVICES

Neither the materials excavated nor the materials or plant used in the construction of the work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.

G-10.06 DUST PREVENTION

The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the streets sprinkled with water at all times.

G-10.07 PRIVATE PROPERTY

The Contractor shall so conduct the work that no equipment, material, or debris will be placed or allowed to fall upon private property in the vicinity of the work unless he shall have obtained the owner's written consent thereto and shall have shown this consent to the Engineer.

**SECTION 11
SLEEVES AND INSERTS**

G-11.01 COORDINATION

When the Contract requires the placing of conduits, saddles, boxes, cabinets, sleeves, inserts, foundation bolts, anchors, and other like work in floors, roofs, or walls of buildings and structures, they shall be promptly installed in conformity with the construction program. The Contractor who erects the floors, roofs, and walls shall facilitate such work by fully cooperating with the Contractors responsible for installing such appurtenances. The Contractor responsible for installing such appurtenances shall arrange the work in strict conformity with the construction schedule and avoid interference with the work of other contractors.

G-11.02 OPENINGS TO BE PROVIDED

In the event timely delivery of sleeves and other materials cannot be made and to avoid delay, the affected Contractor may arrange to have boxes or other forms set at the locations where the appurtenances are to pass through or into the floors, roofs, walls, or other work. Upon the subsequent installation of these appurtenances, the Contractor erecting the structure shall fill around them with materials as required by the Contract. The necessary expenditures incurred for the boxing out and filling in shall be borne by the Contractor or Contractors required to furnish the sleeves and inserts. Formed openings and later installation of sleeves will not be permitted at locations subject to hydrostatic pressure.

**SECTION 12
CUTTING AND PATCHING**

G-12.01 GENERAL

The Contractor shall do all cutting, fitting, or patching of his portion of the work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the Engineer and in accordance with the Plans and Specifications. The work must be done by competent workmen skilled in the trade required by the restoration.

G-13.01 DURING CONSTRUCTION

During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris, and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the Engineer, such material, debris, or rubbish constitutes a nuisance or is objectionable.

The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefor develops.

G-13.02 FINAL CLEANING

At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.

The Contractor shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished, and new appearing condition.

**SECTION 14
MISCELLANEOUS**

G-14.01 PROTECTION AGAINST SILTATION AND BANK EROSION

The Contractor shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed watercourses and drainage ditches.

G-14.02 EXISTING FACILITIES

The work shall be so conducted to maintain existing facilities in operation insofar as is possible. Work shall be scheduled to minimize bypassing during construction. Requirements and schedules of operations for maintaining existing facilities in service during construction shall be as described in the Special Provisions.

G-14.03 USE OF CHEMICALS

All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.



Page 1 of 2 –DMI Payment
City of Tampa – DMI Sub-(Contractors/Consultants/Suppliers) Payments
(FORM MBD-30)

[] Partial [] Final

Contract No.: _____ WO#,(if any): _____ Contract Name: _____

Contractor Name: _____ Address: _____

Federal ID: _____ Phone: _____ Fax: _____ Email: _____

GC Pay Period: _____ Payment Request/Invoice Number: _____ City Department: _____

Total Amount Requested for pay period: \$ _____ Total Contract Amount(including change orders):\$ _____

Type of Ownership - (F=Female M=Male), BF BM = African Am., HF HM = Hispanic Am., AF AM = Asian Am., NF NM = Native Am., CF CM = Caucasian S = SLBE

Type	Trade/Work Activity	Total Sub Contract Or PO Amount	Amount Paid To Date	Amount To Be Paid For This Period
[]Sub []Supplier			Amount Pending Previously Reported	Sub Pay Period Ending Date
Federal ID				
			\$	\$
			\$	\$
			\$	\$
			\$	\$
			\$	\$
			\$	\$

(Modifying This Form or Failure to Complete and Sign May Result in Non-Compliance)

Certification: I hereby certify that the above information is a true and accurate account of payments to sub – contractors/consultants on this contract.

Signed: _____ Name/Title: _____ Date: _____



Page 2 of 2 – DMI Payment

Instructions for completing The DMI Sub-(Contractors/Consultants/ Suppliers) Payment Form (Form MBD-30)

This form must be submitted with all invoicing or payment requests where there has been subcontracting rendered for the pay period. If applicable, after payment has been made to the subcontractor, “Waiver and Release of Lien upon Progress Payment”, “Affidavit of Contractor in Connection with Final Payment”, or an affidavit of payment must be submitted with the amount paid for the pay period. The following will detail what data is required for this form. The instructions that follow correspond to the headings on the form required to be completed. **(Modifying or omitted information from this form my result in non-compliance).**

- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **W.O.#** If the report covers a work order number (W.O.#) for the contract, please indicate it in that space.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid or proposal.
- **Contractor Name.** The name of your business.
- **Address.** The physical address of your business.
- **Federal ID.** A number assigned to a business for tax reporting purposes.
- **Phone.** Telephone number to contact business.
- **Fax.** Fax number for business.
- **Email.** Provide email address for electronic correspondence.
- **Pay Period.** Provide start and finish dates for pay period. (e.g. 05/01/13 – 05/31/13)
- **Payment Request/Invoice Number.** Provide sequence number for payment requests. (ex. Payment one, write 1 in space, payment three, write 3 in space provided.)
- **City Department.** The City of Tampa department to which the contract pertains.
- **Total Amount Requested for pay period.** Provide all dollars you are expecting to receive for the pay period.
- **Total Contract Amount (including change orders).** Provide expected total contract amount. This includes any change orders that may increase or decrease the original contract amount.
- **Signed/Name/Title/Date.** This is your certification that the information provided on the form is accurate.
- **See attached documents.** Check if you have provided any additional documentation relating to the payment data. Located at the bottom middle of the form.
- **Partial Payment.** Check if the payment period is a partial payment, not a final payment. Located at the top right of the form.
- **Final Payment.** Check if this period is the final payment period. Located at the top right of the form.

The following instructions are for information of any and all subcontractors used for the pay period.

- **(Type) of Ownership.** Indicate the Ethnicity and Gender of the owner of the subcontracting business or SLBE.
- **Trade/Work Activity.** Indicate the trade, service, or material provided by the subcontractor.
- **SubContractor/SubConsultant/Supplier.** Please indicate status of firm on this contract.
- **Federal ID.** A number assigned to a business for tax reporting purposes. This information is critical in proper identification of the subcontractor.
- **Company Name, Address, Phone & Fax.** Provide company information for verification of payments.
- **Total Subcontract Amount.** Provide total amount of subcontract for subcontractor including change orders.
- **Amount Paid To Date.** Indicate all dollars paid to date for the subcontractor.
- **Amount Pending, Previously Reported.** Indicate any amount previously reported that payments are pending.
- **Amount To Be Paid for this Period.** Provide dollar amount of dollars requested for the pay period.
- **Sub Pay Period Ending Date.** Provide date for which subcontractor invoiced performed work.

Forms must be signed and dated or will be considered incomplete. The company authorized representative must sign and certify the information is true and accurate. Failure to sign this document or return the document unsigned can be cause for determining a company is in non-compliance of Ordinance 2008-89.

If any additional information is required or you have any questions, you may call the Minority Business Development Office at (813) 274-5522.

0 1 2 3 4 5 6 7 8

Building a Better Tampa

Downtown Riverwalk
 Creates a waterfront pedestrian walkway connecting the south edge of the CapTrust building with MacDill Park.

\$1.5 Million investment
 Scheduled for completion in October, 2012

Orion Marine Construction, Inc.

Improvement Project

City of Tampa Florida

Jane Castor, Mayor

Project Contact:
 Albert Calloway
 Contract Administration
 City of Tampa
 albert.calloway@tampagov.net

For information call:
 (813) 635-3400



Sign Information

Building a Better Tampa

**David L. Tippin Water Treatment Facility
Caustic Soda Piping Improvements**

Project provides for Improvements at the David L. Tippin Water Treatment Facility to Improve the reliability and safety of the Sodium Hydroxide System of the water distribution system within the facility.

\$TBD investment
Scheduled for completion in TBD 2014

TBD

Colors

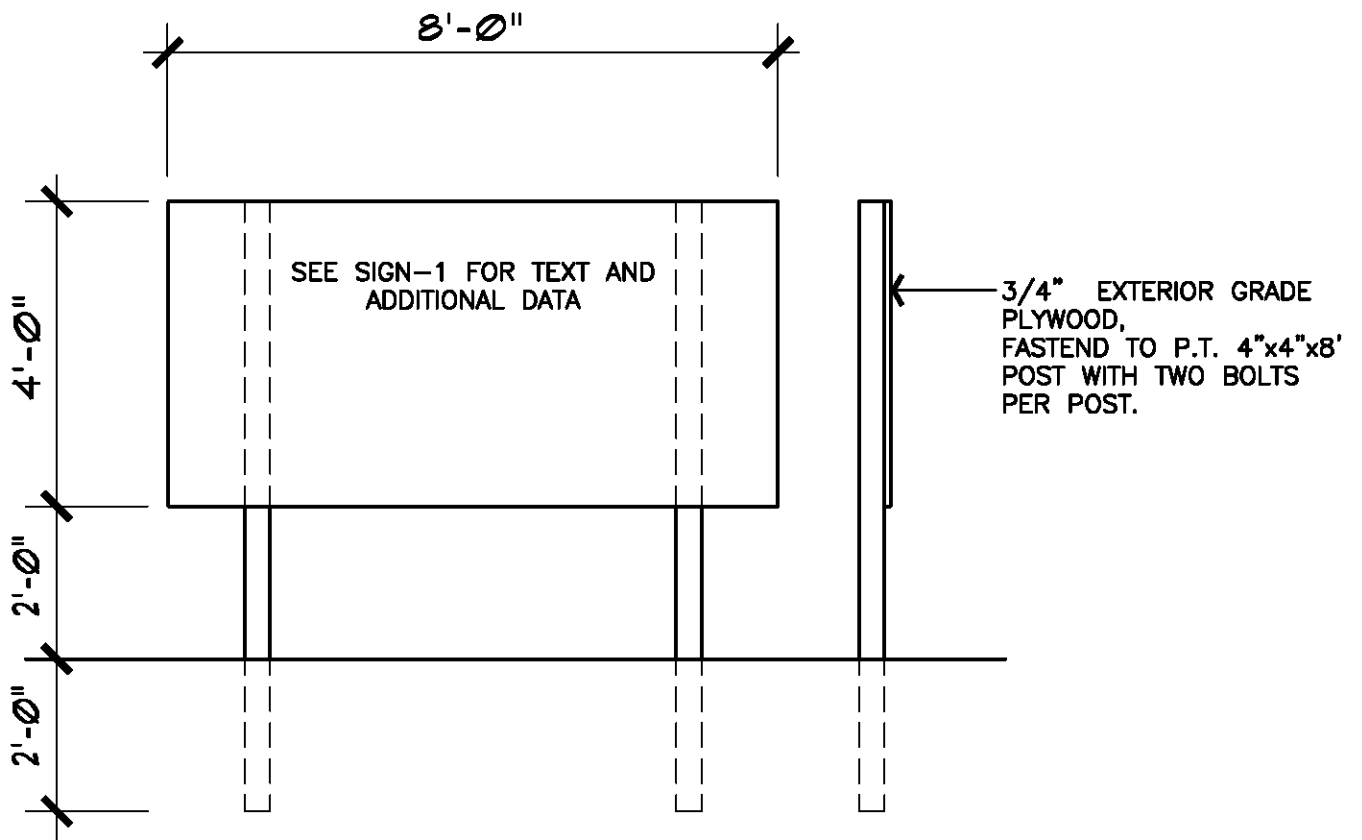
Blue: Sherwin Williams Naval SW6244
Green: Sherwin Williams Center Stage SW 6920
White: Sherwin Williams Pure White SW7005

Font

Franklin Gothic

SIGN EXAMPLE ONLY GRAPHIC TO BE DEVELOPED BY CONTRACTOR

not to scale



DOCUMENT 00 31 19 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. The original construction drawings titled "Improvements to Water Supply Hillsborough River Project, Filtration Plant – Filter & Chemical House" by Nicholas S. Hill, Jr., Consulting Engineer, dated February 1, 1924, are available from the Architect upon request by email to j.hadley@rowearchitects.com.
- C. Drawings that include information on the SCADA system replacement titled "David L. Tippin WTF Upgrades and Improvements, Design-Build, SCADA System Replacement, Contract Number 12-C-00054," dated January 11, 2019, prepared by Engineering Design Technologies Corp. are available from the Owner upon request by email to andre.bien-aime@tampagov.net.
- D. Topographic and Ground Penetrating Radar (GPR) Survey information that includes information on existing conditions, prepared by MacSurvey, Inc., dated May 21, 2018, is available is available from the Architect upon request by email to j.hadley@rowearchitects.com.
- E. Report of Subsurface Exploration and Geotechnical Engineering Services prepared by GHD, dated December 19, 2018 is available from the Architect upon request by email to j.hadley@rowearchitects.com.
- F. Report of Compressive Strength of Concrete Cores for a single sample of the existing building second floor slab prepared by Ardaman & Associates, Inc, dated January 9, 2019 is available from the Architect upon request by email to j.hadley@rowearchitects.com.
- G. Related Requirements:
 - 1. "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 00 31 19

SECTION 01 04 50 - CUTTING AND PATCHING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section. Refer to Section 01 73 00 "Execution" for additional requirements.

SUMMARY

This Section specifies administrative and procedural requirements for cutting and patching.

Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

Requirements of this Section apply to mechanical and electrical installations. Refer to Divisions 22, 23, 26, 27 and 28 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

Demolition of selected portions of the building for alterations is included in Section "Selective Demolition."

QUALITY ASSURANCE

Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

Obtain approval of cutting and patching before cutting and patching:

- Foundation construction.
- Bearing and retaining walls.
- Structural concrete.
- Structural steel.
- Lintels.
- Structural decking.
- Miscellaneous structural metals.
- Equipment supports.
- Piping, ductwork, vessels and equipment.

Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

MATERIALS

Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

INSPECTION

Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

PREPARATION

Temporary Support: Provide temporary support of Work to be cut.

Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

PERFORMANCE

General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and

backfilling.

By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

CLEANING

Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 01 04 50

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work by Owner.
 - 4. Work under separate contracts.
 - 5. Coordination with occupants
 - 6. Specification and Drawing conventions.
- B. Related Requirements:
 - 1. Specific Provisions for access to the site and work restrictions.
 - 2. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Contract 17-D-00009; Building and Site Improvements at David L. Tippin Treatment Facility, for the City of Tampa
 - 1. Project Location: 7125 N 30th Street, Tampa, Florida.
- B. Owner: City of Tampa.
 - 1. Owner's Representative: Jillian Howard.
 - 2. Water Department's Representative: Andre J. Bien-Aime.
- C. Architect: Rowe Architects Incorporated
 - 1. 100 East Madison Street, Suite 200
 - 2. Tampa, Florida 33602
- D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Civil Engineer: Native Engineering, PLLC
 - 2. Structural Engineer: Master Consulting Engineers, Inc.
 - 3. Mechanical & Electrical Engineers: Anston-Greenlees, Inc.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The Work includes, but is not limited to, extensive renovation to the interior of the Administration Building and minor renovations to the Maintenance Building (Welding Shop) and Maintenance Building parking lot at the David L. Tippin Water Treatment Facility (DLTWTF) and the new construction of a central chilled water plant.
 - 2. The Work includes maintaining or restoring certain historic features the Administration Building.

3. The Work includes, but is not limited to, selective demolition, cutting and patching, termite control, concrete slab repair, building insulation, architectural finishes, casework, related mechanical, electrical, fire protection and plumbing work, with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.
- 1.5 VERIFICATION OF OWNER'S SURVEY DATA:
- A. Prior to commencing any work, the Contractor shall verify the accuracy of all survey data which shall affect the Work.
 - B. Should the Contractor discover any inaccuracies or errors which will affect the Work, notify the Architect in order that proper adjustments can be ordered.
- 1.6 WORK BY OWNER
- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- 1.7 WORK UNDER SEPARATE CONTRACTS
- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
 - B. Preceding Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.
 1. Contract Number 12-C-00054, David L. Tippin WTF Upgrades and Improvements, Design-Build, SCADA System Replacement: To Wharton-Smith, Inc.
 - C. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 1. Cable Tray: For providing cable trays for the SCADA system.
 2. Utility Trench: For providing a chilled water utility trench between the Administration Building and the Chiller yard.
- 1.8 ACCESS TO SITE
- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
 - B. Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 - C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy DLTWTF campus, including the adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 011000 TASK ITEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.

1.2 TASK ITEM (T.I.) DESCRIPTION

T.I. 1.1 PROJECT MOBILIZATION

A. Scope of Work

- 1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work defined in this Contract.

T.I. 1.3 LEAD ABATEMENT

A. Scope of Work

- 1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to perform lead abatement when removing existing lead-containing coatings.
- 2. Refer to Terracon report "Report of Asbestos and Lead Containing Paint and Materials Testing", dated April 20, 2016 **for information purposes only.**
- 3. All lead abatement work shall be performed in accordance with all OSHA, EPA, and FDEP standards and regulations.
- 4. 100% lead abatement will be required when performing work for Task Items 3.1, 3.5, 4.1, and 7.8.
- 5. Lead abatement work per Task Item 1.3 is incidental to Task Items listed above.

T.I. 2.3 PARTIAL DEPTH CONCRETE FLOOR REPAIR

A. Scope of Work

- 1. Work consists of furnishing all labor, materials, equipment, staging, formwork, supervision, and incidentals necessary to locate existing spalls, locate and remove full delaminated and unsound concrete from concrete slab, prepare cavities, and install repair materials to restore concrete floor slab to original condition and appearance. Refer to Detail 1/S3.4 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

- 2. Material for repair areas shall be as specified in Section 030105 "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section 030101 "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section 030101 "Surface Preparation for Patching."
3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section 030101 "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section 030101 "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section 030101 "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 3.1 OVERHEAD SLAB REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, shoring, and incidentals necessary to locate existing spalls, locate and remove delaminated and unsound concrete, prepare cavities, and install patching materials to restore slab to original condition and appearance. Refer to Detail 1/S3.1. Refer to Plan Sheets for location of work.
2. Refer to Task Item 1.3 for lead abatement requirements. Lead abatement work required for Task Item 3.1 shall be incidental to this Task Item.

B. Materials

1. Material for repairs shall be as specified in Section 030105 "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section 030101 "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section 030101 "Surface Preparation for Patching."

3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section 030101 "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section 030101 "Surface Preparation for Patching."
5. Contractor shall form concrete with approved materials and prepare cavities for repair placement as specified in Section 030101 "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 3.5 CONCRETE FLOOR BEAM REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, shoring, and incidentals necessary to locate and remove delaminated/spalled concrete, prepare cavities, and install patching materials to restore concrete beams to original condition and appearance. Refer to Detail 2/S3.1. Refer to Plan Sheets for location of work.
2. Refer to Task Item 1.3 for lead abatement requirements. Lead abatement work required for Task Item 3.5 shall be incidental to this Task Item.

B. Materials

1. Material for repairs shall be as specified in Section 030105 "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section 030101 "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section 030101 "Surface Preparation for Patching."
3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section 030101 "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section 030101 "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section 030101 "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 3.6 EXTERIOR CONCRETE BEAM REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, shoring, and incidentals necessary to locate and remove delaminated/spalled concrete, overlay on face of beam, prepare surface, and install patching materials to restore concrete beams to original condition and appearance. Refer to Detail 1/S3.2. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repairs shall be as specified in Section 030101 "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section 030101 "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. **Shoring shall be installed to remove loads from beams under repair. Shoring plans shall be prepared by an engineer registered in Florida and submitted for review and approval. Shoring shall be in place prior to any concrete removal.**
3. Existing overlay on face of beam shall be removed in its entirety.
4. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section 030101 "Surface Preparation for Patching."
5. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section 030101 "Surface Preparation for Patching."
6. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section 030101 "Surface Preparation for Patching."
7. Contractor shall prepare cavities for repair placement as specified in Section 030101 "Surface Preparation for Patching."
8. Install additional reinforcing steel as shown in Detail 1/S3.2.
9. Depth of beam shall be increased by 2 inches as shown in Detail 1/S3.2.
10. Patch installation procedures shall be in accordance with referenced specifications for selected material.
11. For bidding purposes, assume 250 SF of concrete beam repairs.

T.I. 4.1 CONCRETE WALL REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, staging, shoring, bracing, and incidentals necessary to locate and remove unsound concrete from walls, prepare cavities, and install patching materials to restore walls to original condition and appearance. Refer to Detail 1/S3.3. Refer to Plan Sheets for location of work.
2. Refer to Task Item 1.3 for lead abatement requirements. Lead abatement work required for Task Item 4.1 shall be incidental to this Task Item.

B. Materials

1. Material for repairs shall be as specified in Section 030105 "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section 030101 "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section 030101 "Surface Preparation for Patching."
3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section 030101 "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section 030101 "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section 030101 "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 7.5 COVE SEALANT INSTALLATION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to prepare surfaces and install cove sealant between floor and vertical surfaces as shown on Drawings. Refer to Detail 2/S3.3 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Approved materials to be used in this Work are specified in Section 079200 "Joint Sealants."
2. Joint sealant material shall be compatible with coating materials specified in Task Item 7.8.

C. Execution

1. Wall-floor intersection to be sealed shall be thoroughly cleaned by abrasive blasting to remove all contaminants, existing sealant, and foreign material.
2. Entire work area shall then be cleaned with compressed air to assure that all loose particles have been removed and that intersection is dry.
3. Properly prepared intersection shall be coated evenly and completely with joint primer material on each of intersecting faces in accordance with sealant manufacturer's recommendations.
4. After primer has cured, apply cove sealant to intersection such that sealant extends $\frac{3}{4}$ " onto each of intersecting faces.
5. Work cove sealant into joint so that all air is removed and tool to concave shape such that minimum throat dimension of no less than $\frac{1}{2}$ " is maintained.
6. Remove excess sealant and allow to cure.
7. Apply coating on horizontal and vertical surfaces where shown on drawings in even layers in strict accordance with manufacturer's recommendations.

T.I. 7.6 EPOXY INJECTION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, supervision, and incidentals necessary to locate cracks, prepare and inject approved cracks with epoxy resin.

B. Materials

1. Material for crack repairs shall be as specified in Section 036500 "Epoxy Related Work."

C. Execution

1. Contractor shall locate all cracks to receive injection and report them to Engineer for verification.
2. Install repair materials in strict accordance with manufacturer's recommendations and referenced specifications for selected material.
3. At completion of the injection work, contractor shall remove injection ports, and repair the concrete profile to match existing conditions.

T.I. 7.8 EXTERIOR BEAM COATING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, staging, scaffolding, and incidentals necessary apply coating to exterior concrete beam. Refer to Plan Sheets for location of work. Refer to Detail 1/S3.2 for coating extents.

2. Refer to Task Item 1.3 for lead abatement requirements. Lead abatement work required for Task Item 7.9 shall be incidental to this Task Item.

B. Materials

1. Approved materials to be used in this Work are specified in Section 099653 "Coatings."

C. Execution

1. In areas were no concrete repairs are performed, existing coating shall be removed in its entirety.

2. Surface preparation shall be performed by coating system applicator or under its direct supervision.

3. Install crack fillers and primer according to manufacturer's instructions.

4. Surface to receive coating shall be prepared to a surface profile of CSP-3.

5. Coating shall be installed by licensed applicators in strict accordance with manufacturer's recommendations.

6. Coating systems shall be thoroughly cured prior to work areas being returned to service.

T.I. 7.9 WALL COATING REPLACEMENT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, staging, scaffolding, and incidentals necessary to remove existing coating on walls and ceiling and install new coating. Refer to Plan Sheets for location of work.

2. Refer to Task Item 1.3 for lead abatement requirements. Lead abatement work required for Task Item 7.9 shall be incidental to this Task Item.

B. Materials

1. Approved materials to be used in this Work are specified in Section 099653 "Coatings."

C. Execution

1. Remove existing coating on interior surface of walls and ceiling in area delineated on plans. Follow lead abatement requirements per Task Item 1.3.

2. Surface preparation shall be performed by coating system applicator or under its direct supervision.
3. Perform plaster repairs per Task Item 8.6. Where plaster is replaced, new plaster shall be properly cured before installation of new coating.
4. Install crack fillers and primer according to manufacturer's instructions.
5. Surface to receive coating shall be prepared to a surface profile of CSP-3.
6. Coating shall be installed by licensed applicators in strict accordance with manufacturer's recommendations.
7. Coating systems shall be thoroughly cured prior to work areas being returned to service.

T.I. 8.6 PLASTER REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, formwork, supervision, and incidentals necessary to locate and remove damaged and unsound plaster from wall surface, prepare cavities and install repair materials to restore plaster finish surface to original condition and appearance.

B. Materials

1. Material for repair areas shall be as specified in Section 092200 "Portland Cement Plaster."

C. Execution

1. Contractor shall locate and mark all work areas. Marking will be done with methods approved by Engineer and Client. Contractor shall identify all critical repair work areas before starting the work.
2. Remove existing plaster with an appropriate tool. Removal of sound but delaminated plaster may require cutting with a saw or diamond grinder.
3. Cut each overlay layer back further than the preceding one to allow patching in layers. The base coat will be the smallest area and the finish coat will be the largest area to be patched.
4. Refer to Section 092200 "Portland Cement Plaster" for additional requirements including curing and protection.

T.I. 10.1 CAST STONE RESTORATION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, supervision, and incidentals necessary for restoration and repairs specified for the decorative cast stone entryway.

B. Materials

1. Materials as specified in Section 047210 "Cast Stone Restoration and Cleaning" and Section 047200 "Architectural Cast Stone".

C. Execution

1. Contractor shall field verify all dimensions and conditions prior to starting cast stone restoration work.
2. Cast stone units appear to be bearing masonry. Shore all cast stone prior to removing jamb units for replacement.
3. Pin cast stone units in place as directed by project drawings.
4. Patch spalls and surface losses.
5. Remove damaged cast stone jamb units and prepare backup masonry to receive new units.
6. Install new cast stone units as directed.
7. Repoint all joints between cast stone units. Where sealant exists, remove and replace sealant joints.
8. Allow patching compounds, mortar, and grout to cure.
9. Apply coating to new cast stone units and repairs.

END OF SECTION 011000

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Contingency allowances.
 - 2. Lump-sum allowances.
 - 3. Unit-cost allowances.
- C. Related Requirements:
 - 1. Section 01 22 00 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
 - 2. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Allowance is a quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. Obtain proposals from multiple suppliers and / or manufactures for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier or manufacturer.

1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

- B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Contractor's overhead and profit shall be included as part of the Contract Sum and not part of the allowance.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.9 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials selected by Architect under allowance and shall include taxes.
- B. Contractor's costs for freight, receiving and handling at Project site, labor, installation, installation materials, overhead and profit, taxes and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.10 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, and similar margins.
 - 1. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 - 2. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Contingency Allowance: Include a contingency allowance of \$320,000.00 for use according to Owner's written instructions.

- B. Allowance No. 2: Lump-Sum Allowance: Include the sum of \$2,500.00 for room identification panel signs.
- C. Allowance No. 3: Unit-Cost Allowance: For material only include the sum of \$14,550 (\$23.00 per yard) of Carpet Tile, as specified in Section 09 68 13 "Tile Carpeting" and as shown on Drawings.
- D. Allowance No. 4: Unit-Cost Allowance: For material only include the sum of \$14,750 (\$6.00 per square foot) of Ceramic Wall Tile, as specified in Section 09 30 13 "Ceramic Tiling" and as shown on Drawings.

END OF SECTION 01 21 00

SECTION 01 22 00 - UNIT PRICES

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for procedures for using unit prices to adjust quantity allowances.
 - 2. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the Base Bid quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Chilled Water Pipe.
 - 1. Description: Four-inch chilled water pipe, complete with insulation, jacket and installation brackets, between the new central chillers and the Administration Building, located in the pipe trench (provided under a separate contract), and as specified in Section 23 23 13 "Hydronic Piping."
 - 2. Unit of Measurement: Liner feet of chilled water pipe installed in the utility trench.
 - 3. Base Bid: Include 250 liner feet of chilled water pipe installed in the utility trench.
- B. Unit Price No. 2: Roof Framing.
 - 1. Description: At Rooms 117, 118, 119 and 124, provided 2 by 10 wood roof joists sistered to the existing wood joists.
 - 2. Unit of Measurement: 2 by 10 Roof Joist, full length.
 - 3. Base Bid: Include ten (10) 2 by 10 Roof Joists.

END OF SECTION 01 22 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

- j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one trade contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 CONTRACTOR'S REQUEST FOR INFORMATION (RFI's)

- A. The Contractor may, after exercising due diligence to locate required information, request from the Architect clarification or interpretation of the requirements of the Contract Documents. The Architect shall, with reasonable promptness, respond to such Contractor's request for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract Documents or is reasonably inferred from them, the Contractor shall be responsible to the Owner for all reasonable cost charged by the Architect to the Owner for the Additional Services required to provide such information.
- B. The Architect's response to the Contractor's request for clarification or interpretation shall NOT constitute direction to make changes to the work that will increase the Contract Sum or Contract Time.
 - 1. The Architect's response shall be on the Architect's Supplemental Instructions form or directly on the Contractors Request for Information form, in which case it is the Architect' opinion that any Change in the Work is minor and not involving adjustment to the Contract Sum or the Contract Time.
 - 2. If the Architect determines that the response requires a change involving an adjustment to the Contract Sum or the Contract Time, the response will be issued in the form of a Proposal Request.

1.5 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

- c. Include costs of labor and supervision directly attributable to the change.
- d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. RFIs.
 - 3. Digital project management procedures.
 - 4. Project meetings.
 - 5. Coordination.
 - 6. Administrative and supervisory personnel.
 - 7. General installation provisions.
- B. Related Requirements:
 - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 01 33 00 "Submittal Procedures" for conditions of use of the Architects digital files.
 - 3. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 4. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project Close-out activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.

8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name of Contractor.
 3. Name of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: See Section 01 33 00 "Submittal Procedures" for information
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Staff Names: Submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.
 - a. Post copies of the list in the Project meeting room.
 - 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Critical work sequencing and long lead items.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Submittal procedures.
 - j. Preparation of Record Documents.
 - k. Use of the premises and existing building.
 - l. Work restrictions.
 - m. Working hours.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Procedures for moisture and mold control.
 - q. Procedures for disruptions and shutdowns.
 - r. Construction waste management and recycling.

- s. Parking availability.
 - t. Office, work, and storage areas.
 - u. Equipment deliveries and priorities.
 - v. Security.
 - w. Progress cleaning.
4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the activities under consideration, including requirements for the following:
 - a. Submittals.
 - b. Review of mockups.
 - c. Possible conflicts.
 - d. Compatibility requirements.
 - e. Time schedules.
 - f. Compatibility of materials.
 - g. Acceptability of substrates.
 - h. Installation procedures.
 - i. Coordination with other work.
 - j. Protection of adjacent work.
 - k. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Preparation of Contractor's punch list.
 - f. Procedures for processing Applications for Payment at Substantial Completion and for final payment.

- g. Owner's partial occupancy requirements.
 - h. Installation of Owner's furniture, fixtures, and equipment.
 - i. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
 - 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: Representatives of Owner and Architect. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.
- D. Site Condition Reports: Submit at time of discovery of differing conditions.
- E. Unusual Event Reports: Submit at time of unusual event.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- C. Activities: Treat each separate area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 21 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Environmental control.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- F. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities.
- G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.7 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Testing and inspection.
 - 8. Accidents.
 - 9. Meetings and significant decisions.
 - 10. Unusual events.
 - 11. Stoppages, delays, shortages, and losses.
 - 12. Meter readings and similar recordings.
 - 13. Emergency procedures.
 - 14. Orders and requests of authorities having jurisdiction.
 - 15. Change Orders received and implemented.
 - 16. Services connected and disconnected.
 - 17. Equipment or system tests and startups.
 - 18. Partial completions and occupancies.
 - 19. Substantial Completions authorized.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final completion construction photographs.
 - 4. Preconstruction video recordings.
 - 5. Periodic construction video recordings.
- B. Related Requirements:
 - 1. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 02 41 19 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos by email or uploaded to a cloud-based file sharing service. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Date photograph was taken.
 - d. Description of location, vantage point, and direction.
 - e. Unique sequential identifier keyed to accompanying key plan.
- C. Video Recordings: Submit video recordings within seven days of recording.
 - 1. Submit video recordings or uploaded to a cloud-based file sharing service. Include copy of key plan indicating each video's location and direction.
 - 2. Identification: With each submittal, provide the following information in file metadata tag:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Date video recording was recorded.
 - d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time and GPS location data from camera.
- E. File Names: Name media files with date, project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
 - 1. Take photographs of existing buildings either on property to accurately record physical conditions at start of construction.
 - 2. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take photographs as necessary to show status of construction and progress since last photographs were taken, but not less than 10 photographs, monthly coinciding with the cutoff date associated with each Application for Payment.
- E. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

1.7 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 - 1. Confirm date and time at beginning and end of recording.
 - 2. Begin each video recording with name of Project, videographer's name, and Project location.
- C. Preconstruction Video Recording: Before starting demolition, record video recording of Project site and surrounding properties from different vantage points.
 - 1. Show existing conditions adjacent to Project site before starting the Work.
 - 2. Show protection efforts by Contractor.
- D. Periodic Construction Video Recordings: Record video recording monthly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 01 32 33 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
 - 5. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 6. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 7. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required

to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 8. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 9. Drawing number and detail references, as appropriate.
 10. Indication of full or partial submittal.
 11. Location(s) where product is to be installed, as appropriate.
 12. Other necessary identification.
 13. Remarks.
 14. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 14 days for review of each resubmittal.
 - 4. Color Submittals: Allow 30 days from the date the last color submittal is received by the Architect for processing.
 - 5. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 6. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 - D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
 - E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
 - F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- 1.7 SUBMITTAL REQUIREMENTS
- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
 3. Do not include products or options that are not required for this project. If multiple products or options are included clearly mark production and options that are included and the locations where they will be installed.
 4. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 5. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 6. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
- C. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit 2017.
 - c. Data contained on the Architect/Engineers electronic files are part of the Architect/Engineers instruments of service and shall not be used for any purpose other than as a convenience in the preparation of shop drawings for this project. Any use or reuse by any party will be at their sole risk and without liability or legal exposure to the Architect or Engineer. The Users of these electronic file agree to make no claim and waiver, to the fullest extent permitted by law, any claim or cause of action of any nature against the Architect or Engineer, there officers, directors, employees, agents or subcontractors that may arise out of or in connection with the use of the electronic files.
 - d. The Users of the electronic files shall, to the fullest extent allowed by law, indemnify and hold the Architect and/or Engineer harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from the use of these electronic files.

- e. The Users of these electronic files acknowledge that they are NOT construction documents. Difference may exist between these electronic files and the corresponding hard-copy construction documents. The Architect/Engineer makes no representation regarding the accuracy or completeness of the electronic files we provide.
- f. The use of these electronic files does not relieve the Users of their duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.
- g. Because information presented on the electronic files can be modified, unintentionally or otherwise, the Architect/Engineers reserve the right to remove all indicia of ownership and/or involvement from each electronic file.
- h. Delivery of the electronic files shall NOT be deemed a sale. The Architect/Engineer make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall the Architect/Engineer be liable for any loss of profit or any consequential damage as a result of you use of these electronic files.
- i. The Architect/Engineer reserves the right to require a written acknowledgement to these conditions prior to delivery of the electronic files.

D. State of Florida Product Approval:

- 1. Provide proof that the following products and system comply with Florida Product Approval Rule 9B-72.:
 - a. Panel Walls;
 - b. Exterior Doors;
 - c. Roofing Products;
 - d. Skylights;
 - e. Windows;
 - f. Shutters;
 - g. Structural components.
- 2. Rule 9B-72 applies to approval of products and systems, which comprise the building envelope and structural frame, for compliance with the structural requirements of the Florida Building Code.
- 3. Provide installation instructions showing how the products and system are to be installed and maintain a copy of the Product Approval Instalation Instruction on the project for use by the Building Code Officials.

E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
- 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
- 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - b. Do not submit samples for colors, textures or patterns that are not included in the contract price. No increase in contract time or price will be considered on the grounds of selections made from submitted options.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- F. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- H. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

I. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

J. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
 - 1. Material Safety Data Sheets are informational submittals and are not reviewed by the Architect.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes special procedures for alteration work.

1.3 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- F. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- G. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- H. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- I. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- J. Retain: To keep existing items that are not to be removed or dismantled.
- K. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

1.5 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 - 1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

1.7 QUALITY ASSURANCE

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
 - 1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site as designated by Owner.
 - 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
 - 1. Repair and clean items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.
- E. Storage Space:
 - 1. Owner will arrange for limited on-site location(s) for free storage of salvaged material. This storage space includes security and climate control for stored material.
 - 2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.9 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs or preconstruction videotapes.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
 1. <Insert items to be removed by Owner>.
- D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
 1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 5. Contain dust and debris generated by alteration work and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
- B. Temporary Protection of Materials to Remain:
 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection as indicated on Drawings.

3.2 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 01 32 33 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 01 35 16

SECTION 01 35 91 - HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general protection and treatment procedures for designated historic spaces, areas, rooms, and surfaces in Project.

1.3 DEFINITIONS

- A. Consolidate: To strengthen loose or deteriorated materials in place.
- B. Design Reference Sample: A sample that represents Architect's prebid selection of work to be matched; it may be existing work or work specially produced for Project.
- C. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance that are important to the successful rehabilitation as determined by Architect. Designated historic spaces, rooms and surfaces are indicated on Drawings or scheduled in Part 3.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.
- H. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- I. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- J. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- K. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- L. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- M. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.
- N. Retain: To keep existing items that are not to be removed or dismantled.
- O. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.
- P. Salvage: To protect removed or dismantled items and deliver them to Owner.
- Q. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

- R. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. Pedestrian and Vehicular Circulation: Coordinate historic treatment work with circulation patterns within Project building(s) and site. Some work is near circulation patterns and active water treatment. Circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.5 PROJECT MEETINGS FOR HISTORIC TREATMENT

- A. Preliminary Historic Treatment Conference: Before starting historic treatment work, conduct conference at Project site.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor and installers whose work interfaces with or affects historic treatment shall be represented at the meeting.
 2. Agenda: Discuss items of significance that could affect progress of historic treatment work, including review of the following:
 - a. Fire-prevention plan.
 - b. Governing regulations.
 - c. Areas where existing construction is to remain and the required protection.
 - d. Hauling routes.
 - e. Sequence of historic treatment work operations.
 - f. Storage, protection, and accounting for salvaged and specially fabricated items.
 - g. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - h. Qualifications of personnel assigned to historic treatment work and assigned duties.
 - i. Requirements for extent and quality of work, tolerances, and required clearances.
 - j. Methods and procedures related to historic treatments, including product manufacturers' written instructions and precautions regarding historic treatment procedures and their effects on materials, components, and vegetation.
 - k. Embedded work such as flashings and lintels, special details, collection of wastes, protection of occupants and the public, and condition of other construction that affect the Work or will affect the work.
 3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Coordination Meetings: Conduct specifically for historic treatment work at appropriate intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, installer, and other entity concerned with progress or involved in planning, coordination, or performance of historic treatment work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to historic treatment work.
 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of historic treatment work. Include topics for discussion as appropriate to status of Project.
 - a. Schedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
 - b. Schedule Updating: Revise Contractor's Schedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

- c. Review present and future needs of each entity present, including review items listed in the "Preliminary Historic Treatment Conference" Paragraph in this article and the following:
 - 1) Interface requirements of historic treatment work with other Project Work.
 - 2) Status of submittals for historic treatment work.
 - 3) Access to historic treatment work.
 - 4) Quality and work standards of historic treatment work.
 - 5) Change Orders for historic treatment work.
- 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 - 1. Dismantle and salvage each item or object and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.7 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to the work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
 - 1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when historic treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- B. Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project historic treatment program with specific requirements of programs required in other historic treatment Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Safety and Health Standard: ANSI/ASSE A10.6.

1.8 STORAGE AND HANDLING OF HISTORIC MATERIALS

- A. Salvaged Historic Materials:
 - 1. Clean loose dirt and debris from salvaged historic items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site designated by Owner.
 - 5. Protect items from damage during transport and storage.
- B. Historic Materials for Reinstallation:

1. Repair and clean historic items for reuse as indicated.
 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.
- D. Storage: Catalog and store historic items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
1. Owner will arrange for limited on-site location(s) for free storage of historic material. This storage space does not include security and climate control for stored material.
 2. Arrange for off-site locations for storage and protection of historic material that cannot be stored and protected on-site.

1.9 FIELD CONDITIONS

- A. Size Limitations in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.
1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where historic treatment work is being performed.
 3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during historic treatment work.
 5. Contain dust and debris generated by historic treatment work, and prevent it from reaching the public or adjacent surfaces.
 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
- B. Temporary Protection of Historic Materials:
1. Protect existing historic materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.

2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by historic treatment work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for historic treatment work.
 3. Maintain existing services unless otherwise indicated; keep in service and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work in an area, install roofing protection.

3.2 PROTECTION FROM FIRE

- A. Follow fire-prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
 3. Prohibit smoking by all persons within Project work and staging areas.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that area is safe.
 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for type of fire risk in each work area. Ensure that nearby personnel and fire-watch personnel are trained in fire-extinguisher and blanket use.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic treatment program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL HISTORIC TREATMENT

- A. Have historic treatment work performed only by qualified historic treatment specialists.
- B. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 01 32 33 "Photographic Documentation."
- D. Perform regular inspections of Project site as the Work progresses to detect hazards resulting from historic treatment procedures.
- E. Follow the procedures in subparagraphs below and procedures approved in historic treatment program unless otherwise indicated:
 - 1. Retain as much existing material as possible; repair and consolidate rather than replace.
 - 2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
 - 3. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
 - 4. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 01 32 33 "Photographic Documentation."
- F. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.
- G. Where missing features are indicated to be repaired or replaced, provide work with appearance based on accurate duplications rather than on conjecture, subject to approval of Architect.
- H. Where work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- I. Identify new and replacement materials and features with permanent marks hidden in the completed Work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

END OF SECTION 01 35 91

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
- E. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

- F. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- G. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For mockups.
 - 1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
 - 2. Indicate manufacturer and model number of individual components.
 - 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional registered in the State of Florida, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

- A. State of Florida Product Approval: For each type of exterior product and/or system provide the following:
 - 1. Proof that the system/product complies with Florida Product Approval Rule 9B-72.
 - 2. Installation instructions showing how each exterior product and system is to be installed.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports and documents as specified.
- E. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 - 2. Statement that equipment complies with requirements.
 - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 4. Statement whether conditions, products, and installation will affect warranty.
 - 5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 - 1. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.

4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 8. Demolish and remove mockups when directed unless otherwise indicated.
- J. Room Mockups: Construct room mockups according to approved Shop Drawings incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Comply with requirements in "Mockups" Paragraph.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - RODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards listed in the "Referenced Standards" chapter in each volume of the Florida Building Code, use the publication dates referenced in the Florida Building Code.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
 2. FBC – Florida Building Code; www.floridabuilding.org/bc/bc_default.aspx
 3. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
 4. ICC - International Code Council; www.iccsafe.org.
 5. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA
 3. FED-STD - Federal Standard; (See FS).
 4. USAB - United States Access Board; www.access-board.gov.
 5. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Special Provisions site utilization and water and electrical service use charges.
 - 2. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 INFORMATIONAL SUBMITTALS

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference space of sufficient size to accommodate meetings of 8 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table and chairs.
 - 3. Drinking water and private toilet.
 - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 1. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Maintain dust partitions during the Work. Isolate limited work within occupied areas using portable dust-containment devices.
 2. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
1. Processor: Intel Core i5 or i7.
 2. Memory: 8 gigabytes.
 3. Disk Storage: 500 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
 4. Display: 24-inch LCD monitor with 256-Mb dedicated video RAM.
 5. Full-size keyboard and mouse.
 6. Network Connectivity: 10/100BaseT Ethernet.
 7. Operating System: Microsoft Windows 10 Professional.
 8. Productivity Software:
 - a. Microsoft Office Professional, 2010 or higher, including Word, Excel, and Outlook.
 - b. Adobe Reader 11.0 or higher.
 - c. WinZip 7.0 or higher.
 9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
 10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 1.0 Mbps upload and 15 Mbps download speeds at each computer.
 11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
 12. Backup: External hard drive, minimum 2 terabyte, with automated backup software providing daily backups.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Parking: See Special Provisions.
- C. Waste Disposal Facilities: Comply with requirements specified in the Special Provisions and Section 01 74 19 "Construction Waste Management and Disposal."
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
- E. Existing Elevator Use: Use of the existing elevators is permitted.
- F. New Elevator Use: Use of the new elevator will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- G. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- H. Existing Stair Usage: Use of the existing stairs is permitted.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
1. Comply with work restrictions specified in Section 01 10 00 "Summary."
- C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. State of Florida Rule 9B-72 for approval of products and systems, which comprise the building envelope and structural frame:
 - 2. Section 01 21 00 "Allowances" for products selected under an allowance.
 - 3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
 - 4. Section 01 42 00 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Architect's Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 - 3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
 4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 2. Evidence that proposed product provides specified warranty.
 3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 4. Samples, if requested.
- B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for limits on use of Project site.
 - 2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 3. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.6 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - a. Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
 2. Obtain approval of cutting and patching before cutting and patching:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Structural decking.
 - g. Miscellaneous structural metals.
 - h. Equipment supports.
 - i. Piping, ductwork, vessels and equipment.
 3. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 4. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 5. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.

- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- E. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- F. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- G. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- H. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- K. Repair or remove and replace damaged, defective, or nonconforming Work.
 1. Comply with Section 01 77 00 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
 5. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 7. Proceed with patching after construction operations requiring cutting are complete.

- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- 1. Construction Waste: Building materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- 2. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- B. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction.
- C. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DISPOSAL OF WASTE

- A. General: Remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 01 70 00 "Execution" for progress cleaning of Project site.
 - 2. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit test/adjust/balance records.
 - 3. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Owner of changeover in HVAC and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **7** days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 01290 "Payment Procedures."
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Contractor. Label with manufacturer's name and model number where applicable.
 5. Certified List of Incomplete Items: Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), state that each item has been completed or otherwise resolved for acceptance.
 6. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 7days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, will return annotated PDF file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - m. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - o. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 - D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
 - E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.
 - F. Storage or sale of removed items or materials on-site is not permitted.
 - G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - H. Damages: Promptly repair damages caused by demolition work at no cost to Owner.
- 1.7 COORDINATION
- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

- c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches.
 - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 7. Dispose of demolished items and materials promptly.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly.

- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 30 53 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
 - 1. "General Requirements."
 - 2. "Formwork and Formwork Accessories."
 - 3. "Reinforcement and Reinforcement Supports."
 - 4. "Concrete Mixtures."
 - 5. "Handling, Placing, and Constructing."
- B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.3 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- C. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M.

2.4 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.5 RELATED MATERIALS

- A. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.7 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 4. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116, and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

- E. Joints at Existing Slabs: Install dowel bars in chemical grout in edges of existing slabs at a minimum of 48" on center and a minimum of 1 dowel on each edge. Extend dowels a minimum of 4" into existing slab and 8" into new slab.

3.6 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.
- D. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 3000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.7 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.
- C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.
- D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

- E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - 3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Construction Manager will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

END OF SECTION 03 30 53

SECTION 04 03 26 - HISTORIC TERRA COTTA UNIT MASONRY REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment work consisting of repairing historic terra cotta masonry as follows:
 - 1. Repairing unit masonry.
- B. Related Requirements:
 - 1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 05 50 00 "Metal Fabrications" for steel lintels.
 - 3. Section 09 91 23 "Interior Painting" for priming and finish painting steel lintels.

1.3 DEFINITIONS

- A. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and repair.
 - 2. Review methods and procedures related to repairing historic terra cotta masonry, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Quality-control program.
 - d. Fire-protection plan.
 - e. Terra cotta historic treatment program.
 - f. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Work Sequence: Perform masonry historic treatment work in the following sequence, which includes work specified in this and other Sections:
 - 1. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent intrusion of water and other cleaning materials into the wall.
 - 2. Remove paint.
 - 3. Clean masonry.
 - 4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 5. Repair terra cotta masonry, including replacing existing masonry with new masonry materials. If required, repair backup masonry.
 - 6. Rake out mortar from joints to be repointed.
 - 7. Point mortar and sealant joints.

8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include recommendations for product application and use.
 3. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 1. Include plans, elevations, sections, and locations of masonry repair work on the structure.
 2. Show full-size patterns with complete dimensions for new terra cotta units and their jointing, showing relationship of existing units to new units.
 3. Indicate setting number of each new terra cotta unit and its location on the structure in annotated plans and elevations.
- C. Samples for Initial Selection: For the following:
 1. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
 - a. Have each set contain a close color range of at least three. Samples of different mixes of patching compound that match the variations in existing masonry when cured and dry.
 2. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following:
 1. Each type of terra cotta composition and color to be used for replacing existing units. Include sets of Samples to show the full range of color and texture to be expected.
 - a. Terra Cotta Units: Provide one of each shape, color, and texture of unit, suitable and ready for installation.
 - b. Samples in first subparagraph below are of limited value, because they are not cured under same conditions as patching compound used in actual work. A mockup provides a better sample.
 2. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
 3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist, including field supervisors and workers.
- B. Terra cotta historic treatment program.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic terra cotta repair specialist. Experience installing standard unit masonry is insufficient experience for masonry historic treatment work.
 1. Historic Treatment Worker Qualifications: When terra cotta units are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products.

- B. Terra Cotta Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add to the quality-control program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- C. Mockups: Prepare mockups of historic treatment to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
 - 1. Terra Cotta Repair: Prepare sample areas for each type of terra cotta material and assembly indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: Four terra cotta units replaced.
 - b. Patching: Three small holes at least 1 inch in diameter for each type of terra cotta indicated to be patched, so as to leave no evidence of repair.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver terra cotta units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.
- B. Deliver each piece of terra cotta with code mark or setting number on unexposed face, corresponding to Shop Drawings, using nonstaining paint.
- C. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- E. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- F. Store lime putty covered with water in sealed containers.
- G. Store sand where grading and other required characteristics can be maintained and contamination avoided.
- H. Handle terra cotta units to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repair work to be performed according to product manufacturers' written instructions and specified requirements.
- B. Temperature Limits: Repair terra cotta masonry only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
 2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.
- D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Source Limitations: Obtain each type of material for repairing historic masonry (terra cotta, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

- A. Terra Cotta: New terra cotta units that match existing terra cotta units in physical properties, color, surface texture, thickness, profile, dimensions, and composition of surface glaze.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boston Valley Terra Cotta.
 - b. Gladding, McBean; a Division of PABCO.
 2. Terra Cotta Units Matching Existing: Units with tested physical properties according to ASTM C67.
 3. Tolerances as Fabricated: According to tolerance requirements in ASTM C212, Type FTX.
- B. Building Brick: Brick having same vertical dimension as existing backup brick, according to ASTM C62, Grade SW.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II; white or gray or both where required for color matching of mortar.
1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Sand: ASTM C144 unless otherwise indicated.
1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 2. For exposed mortar, provide sand with rounded edges.
- D. Water: ASTM C270, potable.

2.4 MANUFACTURED REPAIR MATERIALS

- A. Terra Cotta Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching terra cotta masonry.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cathedral Stone Products, Inc.
 - b. Conproco Corporation.
 - c. Edison Coatings, Inc.
 2. Use formulation that is vapor and water permeable (equal to or more than the terra cotta unit), exhibits low shrinkage, has lower modulus of elasticity than the terra cotta units being repaired, and develops high bond strength to all types of masonry.
 3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
 4. Formulate patching compound used for patching terra cotta in colors and textures to match each unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.

2.5 ACCESSORY MATERIALS

- A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of terra cotta units, less the required depth of pointing materials unless removed before pointing.
- B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.
- C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
1. Previous effectiveness in performing work involved.
 2. Minimal possibility of damaging exposed surfaces.
 3. Consistency of each application.
 4. Uniformity of the resulting overall appearance.
 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in Contract.
 - b. Leave residue on surfaces.

2.6 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Do not use admixtures in mortar unless otherwise indicated.
- C. Mixes: Mix mortar materials in the following proportions:
1. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic terra cotta repair include, but are not limited to, the following:
 - 1. Specialized Services Group
 - 2. Restocon Corporation
 - 3. Schnell Contractors, Inc.

3.2 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
 - 1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
 - 2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
 - 3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

3.3 MASONRY REPAIR, GENERAL

- A. Have repair work performed only by qualified historic treatment specialist.
- B. Repair Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 10 feet away by Architect.

3.4 TERRA COTTA REMOVAL AND REPLACEMENT

- A. At locations indicated, remove terra cotta units that are damaged, spalled, or deteriorated. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that was supported by removed units.
- C. Maintain reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.
- D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for terra cotta replacement.
- F. Install replacement units into bonding and coursing pattern of existing units.
 - 1. If minor cutting of replacement brownstone terra cotta is required, use a motor-driven grinder or saw designed to cut masonry with clean, sharp, unchipped edges. Do not cut or grind more than 1/8 inch along any edge.
 - 2. Maintain joint width for replacement units to match existing joints.
 - 3. Use setting buttons or shims to set units accurately spaced with uniform joints.
- G. Set replacement units in a full bed of rebuilding (setting) mortar.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing terra cotta.
- H. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.5 TERRA COTTA PATCHING

- A. Patch the following terra cotta units unless another type of repair or replacement is indicated:
 - 1. Units indicated to be patched.
 - 2. Units with holes in rooms with exposed terra cotta.
 - 3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
 - 4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.
- B. Patching Terra Cotta:
 - 1. Remove deteriorated material as determined by sounding gently with a small hammer. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.
 - 2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of unit.
 - 3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
 - 4. Rinse surface to be patched and leave damp, but without standing water.
 - 5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
 - 6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
 - 7. Do not apply patching compound over mortar joints. If patching compound bridges mortar joints, cut out joints after patching compound hardens.
 - 8. Trowel, scrape, or carve surface of patch to match texture, details, and surrounding surface plane or contour of the unit. Shape and finish surface before or after curing, as determined by testing, to best match existing terra cotta.
 - 9. Keep each layer damp for 72 hours or until patching compound has set.

3.6 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.
- B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Remove masking materials, leaving no residues that could trap dirt.

3.7 MASONRY-WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property.
- B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION 04 03 26

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Grille (Screen) block.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry-joint reinforcement.
 - 6. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Cast-stone trim in concrete unit masonry.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work. Show elevations of reinforced walls.
- C. Samples for Verification: For each type and color of the following:
 - 1. Grille (Screen) block.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.

6. Reinforcing bars.
 7. Joint reinforcement.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 - B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
 - C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
 - D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
 - E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- 1.8 FIELD CONDITIONS
- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 - B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
 - C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain Grille (Screen) masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

2.3 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 2. Density Classification: Normal weight.
 3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
 4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.
- C. Grille (Screen) CMUs: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 2. Density Classification: Normal weight.
 3. Basis of Design: A-1 Block Company, #410, 12" by 12."

2.4 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I, except Type III may be used for cold-weather construction. Provide natural color cement.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

- E. Aggregate for Grout: ASTM C 404.
- F. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: Truss type with diagonal cross rods spaced not more than 16" o.c. complying with ASTM A 951/A 951M.
 - 1. Exterior Walls: Hot-dip galvanized, Class B-2 coating (1.5 oz. per sq. ft.), carbon steel.
 - 2. Wire Size for Side Rods: 0.148-inch diameter.
 - 3. Wire Size for Cross Rods: 0.148-inch diameter.
 - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet with prefabricated corner and tee units].

2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated[or needed to provide required compressive strength of masonry.
 - 1. Use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1.
 - 3. Provide grout with a slump of 10 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Fill cores in hollow CMUs with grout 24 inches beams, lintels, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls.
- B. Provide continuity at corners by using prefabricated L-shaped units.

3.6 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

- C. Form control joints in concrete masonry as follows:
 - 1. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.7 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
 - 3. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 10 ft.
 - 4. Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height stop pour at course below bond beam.
 - 5. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
 - 6. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

3.9 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 04 22 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Prefabricated building columns.
 - 3. Shear stud connectors.
 - 4. Shrinkage-resistant grout.
- B. Related Requirements:
 - 1. Section 05 31 00 "Steel Decking" for field installation of shear stud connectors through deck.
 - 2. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
 - 3. Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting" for painting requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Comply with provisions of following, except where more stringent requirements are shown or specified:
 - a. AISC "Code of Standard Practice for Steel Buildings and Bridges."
 - b. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including the "Commentary" and Supplements thereto as issued.
 - c. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 - d. WS D1.1 "Structural Welding Code," latest editions.
 - e. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
- B. Qualifications for Welding Work
 - 1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure."
 - 2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months.
 - 3. If recertification of welders is required, retesting will be the Structural Steel Erector's responsibility and expense.

1.5 COORDINATION

- A. Structural Steel Erector shall fully coordinate the structural steel work. Coordinate with Metal Deck Installer for hoisting of the metal deck.
- B. Structural Steel Erector shall fully verify all dimensions and details. Any discrepancies shall be immediately reported to the Architect.
- C. Structural Steel Erector shall locate dimensionally on setting plans all anchor bolts, inserts, base plates, etc. and shall prepare and deliver all required templates and fully dimensioned setting plans, all in time for the proper execution of the work.
- D. Structural Steel Erector shall set the anchor bolts and inserts. Structural Steel Erector shall field survey all such settings for correctness after they have been cast in place, and before proceeding with steel erection. Checking shall be performed within ten days of notification by concrete installer that his work is complete.
- E. Structural Steel Erector shall within 10 days report to the Architect and certify that he has complied with the above checking requirements and shall indicate any inaccuracies found and corrections which must be made. Any inaccuracies not included in this report and found during or after steel erection shall be the responsibility of the Structural Steel Erector, and the cost of corrective measures shall be borne by him.
- F. Use base lines, bench marks, or other standards for survey work. If permanent building bench marks have been established, they will be used for the aforementioned field checking.
- G. Structural Steel Erector shall coordinate erection areas and sequence and temporary bracing locations.

1.6 SUBMITTALS

- A. Product Data
 - 1. Producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - a. Structural Steel (each type), including certified copies of mill reports covering the chemical and physical properties.
 - b. High strength bolts.
 - c. Structural steel primer paint.
- B. Shop Drawings
 - 1. Shop drawings shall give all necessary information for the fabrication and erection of the structure and shall be based on AISC Specifications. Minimum connections used shall be as indicated on the drawings and shall support the total uniform load capacity of members. Provisions for the connection of other work required shall be indicated and provided by Steel Installer. Index sheets shall be furnished with all beam and column details at the same time the details are submitted for the review of the Architect. Standard connection details conforming to those shown on the drawings shall be submitted with first erection plan. All details shown are typical; similar details apply to similar conditions, unless otherwise indicated.
 - 2. The review of shop drawings shall be for size and arrangement of principal members and strength of connections only.
 - 3. Provide anchor bolt and setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.
 - 4. Promptly notify the Architect whenever design of members and connections for any portion of the structure are not clearly indicated.
 - 5. Shop drawings shall bear the initials of the detailer's checker prior to submission.
 - 6. Shop drawings shall indicate the sequence and extent of areas to be erected by using division or derrick numbers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time so as not to delay that work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. The Structural Steel Erector shall be responsible for any demurrage charges due to failure to unload or store materials properly. Structural steel shall be kept properly drained. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures.
- D. Protection - Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- E. Replacement - In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- F. Shop Fabrication and Assembly
 - 1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on approved shop drawings. Provide camber in structural members where indicated.
 - 2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- G. Connections
 - 1. Shop connections shall be welded or high strength bolted. Field Connections shall be bolted with high strength bolts in friction-type connections conforming to ASTM Designation A325, except where welded connections or other connections are indicated.
 - 2. Combinations of bolts and welds in the same connections are not permitted, unless otherwise shown on the drawings.
 - 3. Where structural joints are made using high strength bolts, hardened washers and nuts tightened to a high tension; the materials, methods of installation and tension control, type of wrenches to be used, and inspection methods shall conform to ASTM Designation A325 as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation. Each bolt shall have a hardened washer under the nut.
 - 4. The high strength bolts used shall have a suitable identifying mark placed on top of the head before leaving the factory.
 - 5. Tightening of nuts shall be done with properly calibrated pneumatic wrenches. The minimum bolt tension for the size of the bolt used shall be in accordance with tables listed in the above referenced Standards. Each wrench shall be checked for accuracy at least once daily for actual conditions of application.
 - 6. Bolts that have been completely tightened shall be marked with identifying symbols.
 - 7. Maintain at the site a properly calibrated torque gauge, and when requested by the Architect, provide a check on any bolt at any time until final acceptance of the work by the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces - General
 - 1. For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam markers, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding or by welding and grinding prior to cleaning, treating, and application of surface finishes.
- B. Structural Steel Shapes, ASTM A992 Grade 50; Plates bars and channels ASTM A36
- C. Steel Pipe - ASTM A500, Grade B (Fy=42 ksi).
- D. Anchor bolts shall conform to ASTM A307 with size and shape as indicated on the drawings.
- E. Steel Tubes – ASTM A500, Grade B (Fy=46 ksi).
- F. Arc Welding Electrodes shall conform to the AWS Code as Revised. All electric current require shall be furnished by Structural Steel Erector.
- G. Paint for Shop Painting Structural Steel and Field Touch-up shall be manufacturer's standard primer.
- H. All items exposed to weather, such as shelf angles and items as noted on the drawings, shall be zinc coated in accordance with the provisions of ASTM Designation A123 as revised to date.

2.2 FABRICATION

- A. General - Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the approved shop drawings.
- B. Bearing surfaces shall be planed to true beds, and abutting surfaces shall be closely fitted. All columns and bearing stiffeners shall be milled to give full bearings.
- C. Bolt holes shall be drilled or punched in accordance with AISC Specifications, subject to the provisions specified herein. Holes shall be accurately centered and shall register true upon erection. Poor matching of holes shall be cause for a rejection. Small errors may be repaired by drilling or reaming.
- D. Contact surfaces shall be thoroughly cleaned before assembly. Assembled parts shall be brought into close contact. Drift pins shall be used only for aligning members and shall not be used in a manner which will damage metal or enlarge or distort holes. Members requiring accurate alignment shall be provided with slotted holes and/or washers for truing up the steel as required. All finished members shall be true to line and free from twists, bends, and open joints.
- E. Welding shall be performed by operators qualified in accordance with the American Welding Society "Standard Qualification Procedure" to perform the type of work required. Such qualification test shall have been passed within the preceding 12-month period. Shop drawings shall indicate the size, length, spacing, and type of all welds. Comply with AWS Code for procedures, appearance and quality of welds, and for methods used in correcting welding work.
- F. Holes for Other Work
 - 1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on approved shop drawings.
 - 2. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
 - 3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

- A. Provide one shop coat of paint as specified under Article "Materials" to all steel except for members receiving galvanizing or as specified hereafter.
- B. Paint shall be delivered to the shop in original sealed containers which shall be clearly marked with the manufacturer's name and the identifying brand number or name. The paint shall be used as prepared by the manufacturer without thinning or other admixtures.
- C. Surface Preparation - After inspection and before shipping, clean steelwork to be painted complying with Steel Structures Painting Council (SSPC) SP-2 "Hand Tool Cleaning," or SSPC SP-3 "Power Tool Cleaning."
- D. Do not paint contact surfaces which are to be welded or high-strength bolted. No paint shall be applied within 3" of any high strength bolt holes.
- E. Do not paint any zinc-coated items.
- F. Paint shall be applied under dry and dust-free conditions and unless otherwise allowed by the Architect, shall not be applied when the temperature is below 45 deg. F. Painting shall be done in workmanlike manner so as to produce an even dry film of uniform thickness of 2 mil. Edges, corners, crevices, and joints shall receive special attention so that they are thoroughly cleaned and they receive an adequate thickness of paint.

PART 3 - EXECUTION

3.1 ERECTION

- A. General - Installer must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Codes - Comply with the AISC Specifications and Code of Standard Practice, and as herein specified. Maintain work in a safe and stable condition during erection.
- C. Anchor Bolts - Steel installer shall furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work. Steel installer shall furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Structural Steel Erector shall set anchor bolts and other insert anchors required.
- D. Field Assembly - Set structural members to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- E. Temporary Shoring and Bracing - Provide as required, with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy line to achieve proper alignment of the structures as erection proceeds. Structural Steel Erector shall coordinate locations of temporary bracing with the Contractor.
- F. Splice members only where indicated.
- G. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream or drill holes that must be enlarged to admit bolts.
- H. Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing.
- I. Touch-up Painting - Immediately after erection, clean field welds, bolted connections, and abraided areas of the shop paint, and paint all exposed areas with the same materials as used for shop painting. Apply by brush or spray to provide a minimum dry file thickness of 2.0 mils.

3.2 TESTING AND INSPECTION

A. General

1. Pay for the services of a Test Laboratory for steel inspection. The Test Laboratory shall be selected by the Architect.
2. Provided certified copies of mill reports covering the chemical and physical properties of the steel used in the work.
3. The Testing Laboratory will test the structural steel for compliance with AISC Specifications for the design, fabrication, and erection of structural steel for buildings. The following testing and inspection procedures are included for reference only and are not included as part of this contract.

B. Shop Inspection, if authorized will include:

1. Examination of structural steel for straightness and alignment.
2. Checking shop connections and fabricated pieces.
3. Testing shop bolts and welds.
4. Examination of all fabricated pieces for proper cleaning and painting.

C. Field Inspection, if authorized, will include:

1. Proper erection and connection of structural members, etc. including tightness of high strength bolts.
2. Proper size and fit of all bolts.
3. Proper alignment of all structural members and plumbness of building.
4. Proper welding methods conforming to American Welding Society Specifications.
5. Proper field Painting.

D. The Testing Laboratory, if authorized, will:

1. Verify that all welding required by the details shall be done by welders who have been qualified within the past year for the positions, materials, and welding procedures in accordance with the latest requirements of the American Welding Society and that all welding materials, welding operators and inspectors shall meet the requirements of the state and local building codes. Affidavits identifying individual welders and their qualifications shall be secured from the fabrication and erector.
2. Submit reports on testing and inspection. Reports shall include detailed data with respect to all requirements of the specifications referenced. Materials or workmanship not meeting the requirements of the Drawings and Specifications, either at the Plant or Project Site, will be rejected by the Testing Laboratory and immediately reported to the Architect. In no case shall the laboratory recommend any method of adjustment or correction without obtaining prior approval of the Architect. Include in all reports and project title and number, location, Structural Steel Erector's name, and date work was performed.
3. Immediately after tests or inspections have been made and in no case later than seven (7) days after tests or inspections have been made, the laboratory shall furnish copies of all test and inspection reports.
4. Upon completion of the work, a final report shall be issued summarizing the inspection performed.

END OF SECTION 05 12 00

SECTION 05 31 00 – STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Section, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Provide metal decking as shown on the drawings, including basic layout and type of deck units required, and specified herein.
- B. Related Work Described Elsewhere
 - 1. Metal Fabrications: Section 05 50 00.

1.3 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Comply with provisions of the following codes and standards, except as otherwise shown or specified.
 - 2. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
 - 3. AWS "Structural Welding Code."
 - 4. SDI "Design Manual for Floor Decks and Roof Decks."
 - 5. MRDTI "Specifications for Steel Roof Deck Construction" as adopted by the Metal Roof Deck Technical Institute.
- B. Qualifications of Field Welding
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure." Welding decking in place is subject to inspection and testing by a Testing Laboratory engaged by the Owner.
 - 2. Remove and replace work found to be defective and not complying with requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading (ultimate pressures) of 102 psf at roof overhang, 41 psf at Zone 1 roof area and 68 psf at Zone 2 and 102 psf at Zone 3 roof areas.
- B. Underwriter's Label: Provide metal deck units manufactured by a firm listed in the Underwriter's laboratories "Fire Resistance Director - Index of Manufacturers." Each required type deck unit shall bear the UL label and marking.

1.5 SUBMITTALS

- A. Shop Drawings: Submit detailed drawings showing size and location of floor and roof framing supports, layout and types of deck panels, deck finish and method, lengths and piece marks of deck units, fastening and anchorage details, and any openings to be cut in field. Deck units shall be marked to show sequence or erection. Detailed drawings shall also indicate closure pieces, fittings, sump pans, any special jointing, and other accessories necessary to provide a complete decking installation. Indicate welds by standard welding symbols adopted by The American Welding Society. Weld washers shall be used for all roof deck.
- B. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.

1.6 COORDINATION

- A. Installer shall coordinate loading of deck units on the steel frame and erection sequence with Structural Steel Installer. Installer shall coordinate the actual size and depth of sump pans.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Deck
- B. Roof Deck Units: Roof deck shall be 1-1/2"-20 gage Type B or 3" 20 gage Type N and galvanized G90 metal deck.
- C. Metal Cover Plates: Fabricate metal cover plates for end-abutting deck units of not less than 18 gage sheet steel. Form to match contour of deck units and approximately 6 inches wide.
- D. Metal Closure Strips: Fabricate metal closure strips, for openings between decking and other construction, of not less than 18-gage sheet steel. Form to provide tight-fitting closure at open ends of cells or flutes and sides of decking.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which metal decking is to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until satisfactory conditions have been corrected in a manner acceptable to installer.

3.2 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and approved shop drawings, and as specified herein.
- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Place deck units in straight alignment for entire length of run.
- D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
- E. Coordinate and cooperate with structural steel installer in loading decking bundles to prevent overloading of structural members.
- F. Do not use floor deck units for storage or working platforms until permanently secured.
- G. End Closures: Tack weld or use machine screws at 3'-0" o.c. for fastening end closures.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, the appearance and quality of welds, and the methods used in correcting welding work.
- I. Side Laps: Steel roof deck and floor deck shall have nesting side laps of adjacent units attached by 3/4-inch diameter #12 screws or button punching at the center of each span or 30 inches o.c., whichever is a least dimension, unless noted otherwise on plans.
- J. Cutting and Fitting: Saw cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking as shown on the drawings.
- K. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.
- L. Closure Strips: Provide metal closure strips at all open perimeter ends, interior openings, uncovered ends and edges of roof and floor decking, and in the voids between decking and other construction. Weld into position to provide a complete decking installation.
- M. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on the top surface of roof deck units.
- N. Touch-up painted surfaces with the above specified paint applied in accordance with the manufacturer's instructions.

END OF SECTION 05 31 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes, but is not limited to:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Elevator hoist beam.
 - 5. Steel shapes for supporting elevator door sills.
 - 6. Slotted channel framing.
 - 7. Metal ladders.
 - 8. Elevator pit sump covers.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Elevator pit metal ladders.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Fasteners.
 - 2. Shop primers.
 - 3. Shrinkage-resisting grout.
 - 4. Manufactured metal ladders.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for countertops.
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Elevator hoist beams.
 - 5. Steel shapes for supporting elevator door sills.
 - 6. Metal ladders.

7. Elevator pit sump covers.

- C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- E. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: 1-5/8 by 1-5/8 inches.
 2. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless steel fasteners for fastening aluminum and stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- F. Post-Installed Anchors: Chemical anchors.
 - 1. Material: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting," and Section 09 91 23 "Interior Painting."
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Section 03 30 00 "Cast-In-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports.

2.7 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3, except for elevator pit ladders.
 - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 - 3. Rungs: 3/4-inch diameter steel bars.
 - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 5. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
 - 6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

2.8 ELEVATOR PIT SUMP COVERS

- A. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.10 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

SECTION 05 51 16 - METAL FLOOR PLATE STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Commercial Class stairs with abrasive-surface floor plate platforms, treads and risers.
 - 2. Steel railings attached to metal stairs.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs and railings.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors, that are to be embedded in concrete or masonry.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal floor plate stairs and the following:
 - 1. Metal floor plate treads.
 - 2. Abrasive-Surface Floor Plate
 - 3. Shop primer products.
 - 4. Grout.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
 - 3. Include plan at each level.
 - 4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
- C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the Florida professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 - 2. Protect steel members and packaged materials from corrosion and deterioration.
 - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs and railings, including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft.
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to L/360.
- C. Structural Performance of Railings: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
 - 3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallurgically bonded to steel.
 - 1. Basis of Design: W.S. Molnar "SlipNOT," Grade 2.
- E. Steel Tubing for Railings: ASTM A 500/A 500M (cold formed) or ASTM A 513/A 513M.
 - 1. Provide galvanized finish.
- F. Steel Pipe for Railings: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish.

G. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941/F 1941M, Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide hot-dip, zinc-coated anchor bolts.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting."

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 or ASTM A 780/A 780M and compatible with paints specified to be used over it.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for exterior use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.

2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.

2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.

2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
 - 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Fabricate stringers of steel tubes.
 - a. Stringer Size: As required to comply with "Performance Requirements" Article, but not less than the sizes shown on the Drawings.
 - b. Provide closures for exposed ends of channel stringers.
 - c. Finish: Galvanized.
 - 2. Construct platforms and tread supports of steel plate headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.
 - a. Provide closures for exposed ends of channel framing.
 - b. Finish: Galvanized.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
- C. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- D. Metal Floor Plate Stairs: Form treads, risers and platforms to configurations shown abrasive-surface floor plate of thickness needed to comply with performance requirements, but not less than 3/16 inch.
 - 1. Form treads and risers as a single unit with integral tread back edge stiffener and perforated risers. Treads and platforms shall be solid, and risers shall be perforated with 1/4-inch holes 3/8 inch o.c. in staggered rows.
 - 2. Weld steel supporting brackets to stringers and weld treads to brackets.
 - 3. Fabricate platforms with integral nosings matching treads and weld to platform framing.
 - 4. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.
 - 1. Material and Finish: Match treads and platforms.
 - 2. Fabricate to dimensions and details indicated.

2.7 FABRICATION OF STAIR RAILINGS

- A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
- B. Welded Connections: Fabricate railings with welded connections.
 - 1. Fabricate connections that are exposed to weather in a manner that excludes water.
 - a. Provide weep holes where water may accumulate internally.
 - 2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 - 3. Weld all around at connections, including at fittings.
 - 4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 5. Obtain fusion without undercut or overlap.
 - 6. Remove flux immediately.
 - 7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 - Partially dressed weld with spatter removed as shown in NAAMM AMP 521.
- C. Form changes in direction of railings as detailed.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.
 - 1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Connect posts to stair framing by direct welding unless otherwise indicated.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
 - 1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 - 3. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.8 FINISHES

- A. Finish metal stairs after assembly. Galvanize exterior stairs.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
 - 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 - 1. Grouted Baseplates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces.
 - a. Clean bottom surface of baseplates.
 - b. Set steel stair baseplates on wedges, shims, or leveling nuts.
 - c. After stairs have been positioned and aligned, tighten anchor bolts.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
 - 3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
 - 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
 - 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.

3.4 REPAIR

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 51 16

SECTION 06 03 12 - HISTORIC WOOD REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of wood in the form of repairing wood features as follows:
 - 1. Repairing wood trim.
 - 2. Replacing wood trim.
- B. Related Requirements:
 - 1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 08 03 52 "Historic Treatment of Wood Windows" for historic wood window repairs, including related trim.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic wood repair.
 - 2. Review methods and procedures related to historic wood repair, including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Wood historic treatment program.

1.4 SEQUENCING AND SCHEDULING

- A. Perform historic wood repair in the following sequence, which includes work specified in this and other Sections:
 - 1. Before removing wood components for on-site or off-site repair, tag each component with location-identification numbers. Indicate on tags and building plans the locations of each component, such as "Baseboard on North Side of Room 101."
 - 2. In the shop, label each repaired component and whole or partial replacement with permanent location-identification number in inconspicuous location and remove site-applied tags.
 - 3. Sort units by condition, separating those that need extensive repair.
 - 4. Clean surfaces.
 - 5. General Wood-Repair Sequence:
 - a. Remove paint to bare wood.
 - b. Repair wood by consolidation, replacement, partial replacement, and patching.
 - c. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
 - 6. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
 - 7. Reinstall components.
 - 8. Apply finish coats.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection: For each type of exposed wood and finish.
 - 1. Identify wood species, cut, and other features.
 - 2. Include Samples of hardware and accessories involving color selection.
- C. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 - 1. Replacement Wood: 12-inch long, full-size molding sections with applied finish.
 - a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.
 - 2. Repaired Wood: Prepare Samples using existing wood removed from site, repaired, and prepared for refinishing.
 - 3. Refinished Wood: Prepare Samples using existing wood removed from site, repaired, and refinished.
 - 4. Hardware: Full-size units with each factory-applied or restored finish.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist, including workers.
- B. Wood Historic Treatment Program: Submit before work begins.

1.7 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood in whole and in part. Experience only in fabricating and installing new woodwork is insufficient experience for wood historic treatment work.
- B. Wood Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- C. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups in locations that enable viewing under same conditions as the completed Work.
 - 2. Wood Trim Repair: Prepare an approximately **72-inch** length of trim to serve as mockup to demonstrate samples of each type of wood repair.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products will not be deformed, broken, or otherwise damaged.
- B. Until installed, store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

PART 2 - PRODUCTS

2.1 HISTORIC WOOD REPAIR, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grade rules, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, "Industry Practices," of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 REPLICATED WOOD ITEMS

- A. Replicated Wood Trim: Custom-fabricated replacement wood units.
 - 1. Joint Construction: Joints matching existing joints.
 - 2. Wood Species: Match species of existing wood.
 - 3. Wood Cut: Match cut of existing wood.
 - 4. Wood Member and Trim Profiles: Match profiles and detail of existing.
 - 5. Date Identification: Emboss on a concealed surface of each replaced item, in easily read characters, "MADE 2019." Manufacturer's name may also be embossed.

2.3 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.
- B. Interior Trim: Match existing species.

2.4 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
- C. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to featheredge.

2.5 MISCELLANEOUS MATERIALS

- A. Cleaning Materials:
 - 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
 - 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- B. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure condition.
- C. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

2.6 WOOD FINISHES

- A. Unfinished Replacement Units: Provide exposed interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site finishing.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect adjacent materials from damage by historic wood repair.
- B. Clean wood of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC WOOD REPAIR, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from **5 feet** away for interior work.
- B. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 09 03 91 "Historic Treatment of Plain Painting" unless otherwise indicated.
 - 3. Repair items in place where possible.
 - 4. Install temporary protective measures to protect wood-treatment work that is indicated to be completed later.
 - 5. Refinish historic wood according to Section 09 03 91 "Historic Treatment of Plain Painting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade

wood substrate, reducing clarity of detail. Do not use abrasive methods, such as sanding, wire brushing, or power tools, except as indicated as part of the historic treatment program and as approved by Architect.

- D. Repair Wood: Match existing materials and features, retaining as much original material as possible to perform repairs.
 - 1. Unless otherwise indicated, repair wood by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Where indicated, repair wood by limited replacement matching existing material.
- E. Replace Wood: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
 - 1. Do not use substitute materials unless otherwise indicated.
- F. Identify removed items with numbering system corresponding to item locations, to ensure reinstallation in same location. Key items to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD PATCH-TYPE REPAIR

- A. General: Patch wood that exhibits depressions, holes, or similar voids, and that has limited amounts of rotted or decayed wood.
 - 1. Verify that surfaces are sufficiently clean and free of paint residue prior to patching.
 - 2. Treat wood with wood consolidant prior to application of patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and refuses to absorb more. Allow treatment to harden before filling void with patching compound.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
 - 3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 - 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 - 5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood items at locations where damage is too extensive to patch.
 - 1. Remove surface-attached items from wood surface before performing wood-replacement repairs unless otherwise indicated.
 - 2. Verify that surfaces are sufficiently clean and free of paint residue prior to repair.
 - 3. Remove broken, rotted, and decayed wood down to sound wood.
 - 4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.

5. Secure new wood using multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
 - B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
 - C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
 - D. Clean spilled materials from adjacent surfaces immediately.
 - E. Reinstall items removed for repair into original locations.
- 3.5 CLEANING AND PROTECTION
- A. Protect wood surfaces from contact with contaminating substances resulting from construction operations. Monitor wood surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact wood surfaces, remove contaminants immediately.
 - B. Clean exposed surfaces immediately after historic wood repair. Avoid damage to coatings and finishes. Remove excess sealants, patching materials, dirt, and other substances.

END OF SECTION 06 03 12

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking, cants, and nailers.
 - 3. Wood sleepers.
 - 4. Plywood backing panels.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 DIMENSION LUMBER FRAMING

- A. Joists, Rafters, and Other Framing: No. 2 of the following species:
 - 1. Southern pine or mixed southern pine; SPIB.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. Dimension Lumber Items: Construction or No. 2, the following species:
 - 1. Mixed southern pine or southern pine; SPIB.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.7 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

2.8 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
 - 2. Provide solid pressure treated wood blocking, 2 by 6 minimum or 2 layers of $\frac{3}{4}$ plywood 6" high minimum, between wood or metal framing for attachment of wall mounted accessories and equipment, including but not limited to the following:
 - a. Wall stops for doors.
 - b. Toilet Compartments; provide continuous vertical blocking for continuous wall brackets.
 - c. Toilet and Bath Accessories.
 - d. Hand rail and Guard rail brackets.
 - e. Projection Screens
 - f. Mechanical equipment.
 - g. Electrical equipment.
 - h. TV and VCR Mounting Brackets.
 - i. AV projectors
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.
 - 1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
 - 2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.
- B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For the following, from ICC-ES:
 - 1. Air-barrier and water-resistant glass-mat gypsum sheathing.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

1. Air-Barrier Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WALL SHEATHING

- A. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M, Type X, coated fiberglass mat gypsum sheathing with integral weather-resistant barrier and air barrier complying with ASTM E 2178.
 1. Thickness: 5/8 inch thick.
 2. Edges: Square.
 3. Flashing and Transitions Strips: As acceptable to sheathing manufacturer.
 4. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference when tested according to ASTM E 2178.
 5. Vapor Permeance: Minimum 20 perms when tested according to ASTM E 96/E 96M, Desiccant Method, Procedure A.
 6. UV Resistance: Can be exposed to sunlight for 90 days according to manufacturer's written instructions.
 7. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by sheathing manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. For wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the Florida Building Code.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

- F. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing:
1. Install accessory materials according to sheathing manufacturer's written instructions and details to form a seal with adjacent construction, to seal fasteners, and ensure continuity of air and water barrier.
 - a. Coordinate the installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - b. Install transition strip on roofing membrane or base flashing, so that a minimum of 3 inches of coverage is achieved over each substrate.
 2. Connect and seal sheathing material continuously to air barriers specified under other Sections as well as to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
 3. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
 4. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip, so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 - a. Transition Strip: Roll firmly to enhance adhesion.
 5. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
 6. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
 7. Seal top of through-wall flashings to sheathing with an additional 6-inch-wide, transition strip.
 8. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
 9. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending 6 inches beyond repaired areas in strip direction.

END OF SECTION 06 16 00

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior plywood paneling and trim.
 - 2. Shelving and clothes rods.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

- A. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
 - 1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
 - 2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
 - 1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
 - 2. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece[, or omit grade stamp and provide certificates of grade compliance issued by grading agency].

2.2 INTERIOR TRIM

- A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Match existing; NHLA [Clear] [A Finish] [B Finish].
 - 2. Maximum Moisture Content: 13 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Not allowed.
 - 5. Veneered Material: Not allowed.
 - 6. Face Surface: Surfaced (smooth).
 - 7. Matching: Selected for compatible grain and color.
- B. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): MMPA WM 4, N-grade wood moldings made to patterns included in MMPA's "HWM/Series Hardwood Moulding Patterns."
 - 1. Species: Match existing.
 - 2. Maximum Moisture Content: 9 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Matching: Selected for compatible grain and color.
 - 5. Base Pattern: AWI BAS-1022, 7/16-by-5-1/4-inch.
 - 6. Casing Pattern: Match existing casing.

2.3 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
 - 1. Face Veneer Species and Cut: Plain-sliced White Maple.
 - 2. Veneer Matching: Selected for similar color and grain.
 - 3. Backing Veneer Species: Any hardwood compatible with face species.
 - 4. Construction: Veneer core.
 - 5. Thickness: 7/16 inch.
 - 6. Panel Size: As indicated on the Drawings.
 - 7. Glue Bond: Type II (interior).
 - 8. Finish: Match Flush Wood Doors, see Section 08 14 16.

2.4 SHELVING AND CLOTHES RODS

- A. Closet Shelving: Made from one of the following materials, 3/4 inch thick:

1. MDO softwood plywood with solid-wood edge.
 2. Melamine-faced particleboard with applied-PVC front edge.
- B. Shelf Cleats: 3/4-by-3-1/2-inch boards with hole and notch to receive clothes rods, as specified above for shelving.
- C. Clothes Rods: 1-1/2-inch-diameter, clear, kiln-dried Douglas fir or southern pine.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.

2.6 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
1. Interior standing and running trim, except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
1. Use concealed shims where necessary for alignment.
 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
 1. Do not use pieces less than 24 inches long, except where necessary.
 2. Stagger joints in adjacent and related standing and running trim.
 3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
 4. Use scarf joints for end-to-end joints.
 5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 7. Install trim after gypsum-board joint finishing operations are completed.
 8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 9. Fasten to prevent movement or warping.
 10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.
 1. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings.
 2. Install with uniform tight joints between panels.
 3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
 4. Space fasteners and adhesive as recommended by panel manufacturer.
 5. Conceal fasteners.

3.6 SHELVING AND CLOTHES ROD INSTALLATION

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
 1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
 2. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.]
 3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
 4. Remove adhesive that is squeezed out after fastening shelf cleats in place.
- B. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- C. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.

1. Install shelves, fully seated on cleats, brackets, and supports.
2. Fasten shelves to cleats with finish nails or trim screws, set flush.

3.7 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements.
 1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.8 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces.
- B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.9 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-faced architectural cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
 - 2. Section 12 36 61 "Quartz Agglomerate Countertops."

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For plastic-laminate-faced architectural cabinets.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show large-scale details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.
- C. Samples for Initial Selection: For each type of exposed finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.

- C. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed / concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade:
 - 1. PL-1: Custom.
 - 2. PL-2: Premium.
- C. Type of Construction: Frameless.
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS, matching laminate in color, pattern, and finish.
 - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. PL-1: Solid colors or patterns, matte finish.
 - b. PL-2: Wood grains, matte finish.
 - 1) Install wood grain vertically for drawer fronts, doors, and fixed panels.
 - 2) Match grain pattern on adjacent drawer fronts and door.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood Products: Products shall be made without urea formaldehyde.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- F. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.
 - a. Type: Full extension.
 - b. Material: Epoxy-coated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.

4. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.

- G. Door and Drawer Silencers: BHMA A156.16, L03011.
- H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Stainless Steel: BHMA 630.
- I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate and Edges: Resorcinol.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips; No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish; toggle bolts through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 07 21 00 - THERMAL AND ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Loose-fill insulation.
- B. Related Requirements:
 - 1. Section 07 21 19 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
 - 2. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

2.2 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using one of the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- E. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.3 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated.

END OF SECTION 07 21 00

SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Closed-cell spray polyurethane foam.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer. Any repairs by an Icynene licensed contractor.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Fire Resistance Characteristics: As determined by testing identical products according to NFPA 285 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect spray polyurethane foam components as follows:
 - 1. Store between 60 deg F and 90 deg F.
 - 2. Follow manufacturer's published installation instructions.
 - 3. Components should be a matched set (system) as supplied by the manufacturer.
 - 4. Use components within their labeled shelf life.
 - 5. Use components as supplied with no site alterations or additions.

1.7 WARRANTY

- A. Refer to manufacturer's standard warranty terms.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Air Material Air-Leakage Rate: Maximum material air-leakage rate of less than 0.004 cfm/sq. ft. under a pressure differential of 0.3 in w.g. (1.6 psf) per ASTM E 2178 or ASTM E 282.

- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Development Index: 450 or less.
- C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- D. Compressive Strength: Minimum 40 psi (ASTM C 1029, Type II).
- E. Sustainability Requirements: Provide spray polyurethane foam insulation as follows:
 - 1. Low Emitting: Insulation tested according to CA/DPH/EHLB/v1.1-2010.
 - 2. Resistant to fungal growth as per ASTM C 1338.
 - 3. Contains no PBDE.

2.2 CLOSED-CELL SPRAY-POLYURETHANE FOAM

- A. Closed-Cell Spray-Polyurethane Foam: ASTM C 1029, Type II, minimum density of 2.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 7.0 deg F x h x sq. ft./Btu at 75 deg F.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Icynene Inc.; Icynene ProSeal LE or comparable product by one of the following:
 - a. BASF Corporation.
 - b. Dow Chemical Company (The).

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.
- B. Thermal Barrier: Provide one of the following:
 - 1. ½-inch gypsum wallboard.
 - 2. International Fireproof Technology Inc. DC-315: water-based, intumescent paint.
 - 3. International Cellulose Corporation, URE-K Thermal Barrier System.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Do not apply insulation within 3 inches of heat emitting devices or where the temperature is in excess of 200 deg F per ASTM C 411, or in accordance with applicable codes.
- E. Thickness: Install as necessary to achieve R38.

- F. Thermal Barrier: Provide thermal barrier over spray-applied polyurethane foam insulation installed above occupied spaces.
- G. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Thermal Protection: Protect installed spray-polyurethane-foam insulation with qualified thermal or ignition barrier per applicable building codes.
- C. Install intumescent paint to required wet or dry mil thickness or coverage rate in accordance with manufacturer's instructions, by brush, roller, conventional or airless spray.

END OF SECTION 07 21 19

SECTION 07 32 13 - CLAY ROOF TILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Replacement parapet coping clay roof tiles as required

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079, glossaries in TRI/WSRCA's "Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions," and NRCA's "NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PREINSTALLATION MEETINGS

- 1. Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.
- 2. Preinstallation Conference: Conduct conference at Project site.
- 3. If needed, insert list of conference participants not mentioned in Section 01 31 00 "Project Management and Coordination."

1.5 ACTION SUBMITTALS

- A. Product Approval: For each roofing system provide the following:
 - 1. Proof that the system/products comply with Florida Product Approval Rule 9B-72.
 - 2. Installation instructions showing how the system/products are to be installed.
- B. Product Data: For each type of product.
- C. Samples: For each exposed product and for each color and texture specified.
 - 1. Clay Roof Tiles: Full size.

1.6 INFORMATIONAL SUBMITTALS

- A. Protection Plans: Provide a specific protection plan that describes the means of maintaining the building in a safe and watertight condition throughout the construction period. Newly installed roof systems shall be considered in the protection plan to ensure roofing operations do not damage them. Areas where the roof deck/structure is (or may be) damaged or deteriorated shall only be re-roofed when the occupied spaces below are unoccupied. Other potential phases of reroofing operations can be hazardous to the facility and its occupants and shall be carefully reviewed during bidding and at appropriate phases during construction.
- B. Material Test Reports: For each type of clay roof tile, based on evaluation of comprehensive tests performed by a qualified testing agency.
- C. Evaluation Reports: From ICC-ES or other testing and inspecting agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes for the following:
 - 1. High-temperature self-adhering underlayment.
- D. Sample Warranty: For manufacturer's materials warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Clay Roof Tiles: 100 sq. ft. of each type, in unbroken bundles.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store underlayment rolls in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
 - 1. Store on end, on pallets or other raised surfaces. Do not double stack rolls.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- C. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements.
 - 1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.11 WARRANTY

- A. Manufacturer's Warranties: Manufacturers shall provide system warranties that meet the following criteria:
 - 1. Roofing system shall be guaranteed against defects in materials and/or workmanship for a period of 20-year NDL (No-Dollar-Limit) warranty from the date of the Certificate of Substantial Completion. During this period, the manufacturer shall pay all costs of repairs to the roof system necessary to correct roof leaks resulting from any one of the following causes:
 - a. Improper workmanship in application of roofing system and substrate components.
 - b. Deterioration of roof membrane or flashing caused by ordinary weathering and/or exposure to ultra-violet light.
 - c. Blisters, buckles, ridges, wrinkles, fish mouths, and slips.
 - d. Damage to roofing system and substrate due to thermal shock (extreme temperature fluctuations).
 - e. Slippage of roofing system components.
 - f. Breaks in roofing system or substrate components.
 - 2. During the warranty period, the Manufacturers and the Roofing Contractor agree that, within 24 hours of receipt of notice from the Owner, they will inspect and make immediate emergency repairs to defects or to leaks in the roofing system. They further agree that, within a reasonable time, they shall restore the affected items to the standard of the original specifications.
 - 3. Warranty shall be in written form acceptable to the Owner and shall be made by an authorized representative the manufacturer of the roofing membrane system used and shall be for the full period of time as specified herein.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of clay-tile roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- C. All emergency work and permanent work done during the Warranty Period shall be done without cost to the Owner, except in the event it is determined that such leaks were caused by Owner abuse, vandalism, lightning, hurricane, tornado, hail storm or other cause typically excluded by warranty documents.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. General: Roofing systems/products that are incorporated into the Work shall comply with Florida Product Approval Rule 9B-72.

2.2 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide clay roof tiles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.3 CLAY TILES

- A. Clay Roof Tiles: ASTM C 1167, molded- or extruded-clay roof tile units of shape and configuration indicated, kiln fired, and free of surface imperfections. Provide with fastening holes prepunched at factory before firing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Ludowici Roof Tile.
 - 2. Durability: Grade 1.
 - 3. Shape: French Interlocking Tile to match existing.
 - 4. Size: Match existing.
 - 5. Finish and Texture: Match existing.
 - 6. Color: Match existing.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586/D 4586M, Type II, asbestos free.
- B. Elastomeric Sealant: ASTM C 920, elastomeric silicone-based joint sealant of type, grade, class, and use classifications required to seal joints in clay-tile roofing and remain watertight.
- C. Mortar: ASTM C 270, Type M, with ASTM C 979/C 979M, pigmented mortar matching the color of clay roof tiles for exposed-to-view mortar, and natural color for concealed-from-view mortar.
- D. Wood Nailers: Comply with requirements for pressure-preservative-treated wood in Section 06 10 53 "Miscellaneous Rough Carpentry."

2.5 FASTENERS

- A. Wood Batten Nails: ASTM F 1667; common or box, steel wire, flat head, and smooth shank.
- B. Wire Ties: Copper or Stainless steel, 0.083-inch minimum diameter.
- C. Hook Nails: One-piece wind lock and clay roof tile fastener system, minimum 0.135-inch-diameter copper wire, for direct deck nailing.
- D. Storm Clips: Stainless-steel, minimum 0.048-by-1/4-inch strap-type, L-shaped retainer clips designed to secure side edges of clay roof tiles. Provide with two fastener holes in base flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Examine sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provision has been made for flashings and penetrations through roofing.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CLAY TILE INSTALLATION

- A. General: Install clay tiles according to manufacturer's written instructions and recommendations in TRI/WSRCA's "Concrete and Clay Roof Tile Design Criteria Installation Manual for Moderate Climate Regions" and NRCA's "NRCA Roofing Manual: Steep-Slope Roof Systems" unless more stringent requirements are indicated.
 1. Maintain uniform exposure and coursing of clay tiles throughout roof and walls.
 2. Extend tiles 2 inches over eave fasciae.
 3. Nail Fastening: Drive nails to clear the clay roof tile so the tile hangs from the nail and is not drawn up.
 - a. Install wire through nail holes of cut tiles that cannot be nailed directly to roof deck and fasten to nails driven into deck.
 4. Wire-Tie Fastening: Install wire-tie systems and fasten clay roof tiles according to manufacturer's written instructions.
 5. Storm Clips: Install to capture edges of longitudinal sides of clay roof tiles and securely fasten to roof deck.
 6. Tile Locks: Install to support and lock overlying tile butts to underlying tiles.
 7. Cut and fit clay tiles neatly around roof vents, pipes, ventilators, and other projections through roof. Fill voids with mortar.
- B. Flat Interlocking Clay Roof Tile Installation:
 1. Provide minimum 3-inch lap between succeeding courses of clay tiles.
 2. Offset joints by half the clay tile width in succeeding courses.
 3. Install L-shaped rake tiles.
 4. Install ridge tiles in V-ridge configuration with laps facing away from prevailing wind. Seal laps with elastomeric sealant.
 - a. Close voids where ridge tiles meet clay roof tiles with ridge closure tiles.
 5. Install hip tiles in V-ridge configuration. Seal laps with elastomeric sealant.
 - a. Fill voids with mortar where hip tiles meet clay roof tiles, and strike mortar flush with face of hip cover tiles.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or broken clay roof tiles.
- B. Remove excess clay roof tiles and debris from Project site.

3.4 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS **<Insert name>** of **<Insert address>**, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:
 1. Owner: The City of Tampa
 2. Address: 315 East Kennedy Boulevard, Tampa, Florida 33602
 3. Building Name: Administration Building
 4. Address: David L. Tippin Water Treatment Facility
 5. Area of the Work: Clay roof tile
 6. Acceptance Date: **<Insert date>**.
 7. Warranty Period: Two years from the date of the Certificate of Substantial Completion.
 8. Expiration Date: **<Insert date>**.

- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding 135 mph;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
 4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.
- E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.
1. Authorized Signature: **<Insert signature>**.
 2. Name: **<Insert name>**.
 3. Title: **<Insert title>**.

END OF SECTION 07 32 13

SECTION 07 52 13 - ATACTIC-POLYPROPYLENE (APP) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 1. Atactic-polypropylene (APP)-modified bituminous membrane roofing.
 2. Roof insulation.
 3. Cover board.
 4. Walkways.
- B. Related Requirements:
 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 2. Section 06 16 00 "Sheathing" for wood-based, structural-use roof deck panels.
 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 1. Meet with Owner, Architect, Contractor, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 5. Review structural loading limitations of roof deck during and after roofing.
 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 7. Review governing regulations and requirements for insurance and certificates if applicable.
 8. Review temporary protection requirements for roofing system during and after installation.
 9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Base flashings and membrane terminations.
 3. Flashing details at penetrations.

4. Tapered insulation, including slopes.
 5. Roof plan showing orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 6. Crickets, saddles, and tapered edge strips, including slopes.
 7. Insulation-fastening patterns for corner, perimeter, and field-of-roof locations.
- C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Approval: For each roofing system provide the following:
1. Proof that the system/products comply with Florida Product Approval Rule 9B-72.
 2. Installation instructions showing how the system/products are to be installed.
- B. Qualification Data: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- C. Manufacturer Certificates:
1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
- D. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency indicating compliance with specified requirements.
- E. Field quality-control reports.
- F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.
- C. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain primary products, including roof membrane, base plies, base flashings, membrane adhesives, roof insulation boards, roof insulation fasteners and adhesives products from a single manufacturer. Provide secondary products recommended by the manufacturer of primary products for use with roofing system provided.
1. ISO 9001:2000 Certification: The manufacturer must provide documentation showing the manufacturer has current ISO 9001:2000 certification for the specific manufacturing plant where the modified bitumen membrane products are produced.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
1. Protect stored liquid material from direct sunlight.
 2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
 - 1. Store in a dry location.
 - 2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system, such as roof membrane, base flashing, roof insulation, fasteners, cover boards, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Florida Product Approval: Roofing systems/products that are incorporated into the Work shall comply with Florida Product Approval Rule 9B-72.
- B. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test in FM Approvals 4470.
- C. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- D. Wind Uplift Resistance: Design roofing system to resist the wind uplift pressures indicated on the Drawings when tested according to FM 4474, UL 580, or UL 1897:
 - 1. Minimum Wind Uplift Load Capacity: refer to structural drawings.
- E. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 - 1. Fire/Windstorm Classification: Class 1A-120.

- F. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical to that specified for this Project.
- G. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- H. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- I. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.
 - 1. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturer approved by roof membrane manufacturer.
- B. Basis of Design System:
 - 1. Derbigum Americas, Inc.
 - 2. Florida Product Approval: FL 16290-R7, 2017 Code Version, Table 3A.
 - a. Minimum Design Pressure: -96 psf.

2.3 BASE SHEET MATERIALS

- A. APP-Modified Bitumen Fiberglass-Mat Base Sheet: ASTM D6509/D6509M, APP-modified asphalt sheet, reinforced with glass fibers; smooth surfaced; suitable for cold adhesive application.
 - 1. Basis-of-Design Product: DERBIGUM Americas, Inc.; "Derbibase Ultra"
 - 2. Minimum Thickness: 120 mil.

2.4 ATACTIC-POLYPROPYLENE (AAP) MODIFIED BITUMINOUS CAP SHEET

- A. Granule-Surfaced Roofing Cap Sheet: ASTM D6223/D6223M, Type I, Grade G, APP-modified asphalt sheet reinforced with a combination of polyester fabric and glass fibers; suitable for cold-adhesive application method.
 - 1. Basis-of-Design Product: DERBIGUM Americas, Inc.; Derbicolor GP.
 - 2. Minimum Thickness: 180 mil.
 - 3. Granule Material: Mineral ceramic coated.
 - 4. Granule Color: CR Bright White.

2.5 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D6223/D6223M, Type I or II, Grade S, APP-modified asphalt sheet reinforced with a combination of polyester fabric and glass fibers; smooth surfaced; suitable for application method specified.
- B. Granule-Surfaced Flashing Sheet: ASTM D6223/D6223M, Type I, Grade G, APP-modified asphalt sheet reinforced with a combination of polyester fabric and glass fibers; granule surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White.
- C. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D1668/D1668M, Type I.
- D. Liquid Flashing System: Roof membrane manufacturer's standard one- or two-part moisture curing resin with low solvent content, consisting of a primer, flashing cement, and scrim.

2.6 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- C. Metal Termination Bars: Manufacturer's standard, predrilled, stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- D. Asphalt Primer: ASTM D41/D41M.
- E. Cold-Applied Asphalt Adhesive: ASTM D3019, Type III, roof membrane manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive, specially formulated for compatibility and use with roofing membrane.
 - 1. Basis-of-Design Product: DERBIGUM Americas, Inc.; Permastic.
- F. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- H. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve; color to match roof membrane.
- I. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards, manufactured by roof membrane manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. Basis-of-Design Product: Basis-of-Design Product: DERBIGUM Americas, Inc.; Derbi-board or comparable product approved by the roofing membrane manufacturer and listed in the Florida Product Approval.
 - 2. Compressive Strength: 20 psi.
 - 3. Size: 48 by 48 inches
 - 4. Thickness:
 - a. Base Layer: 1-1/2 inches.
 - b. Upper Layer: 2 inches.
 - 5. Minimum R Value: 20, continuous.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/8 inch per 12 inches unless otherwise indicated, to increase the existing structure slope on 1/8 inch per 12 inches to 1/4 inch 12 inches.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Basis-of-Design Product: Basis-of-Design Product: DERBIGUM Americas, Inc.; Derbibond LR or comparable product approved by the roofing membrane manufacturer and listed in the Florida Product Approval.:
 2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
 3. Full-spread spray-applied, low-rise, two-component urethane adhesive.
- D. Cant Strips: Modified bitumen cant strip.
- E. Tapered Edge Strips: ASTM C728, perlite insulation board.
- F. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch thick.
1. Basis of Design: USG Corporation; Securock Gypsum-Fiber Roof Board.

2.9 WALKWAYS

- A. Walkway Cap Sheet Strips: ASTM D6223/D6223M, Grade G, Type II, APP-modified asphalt sheet reinforced with a combination of polyester fabric and glass fibers); granule surfaced; suitable for application method specified, and as follows:
1. Size: 36 by 60 inches.
 2. Granule Material: Mineral ceramic coated.
 3. Granule Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
 - a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with not less than three test probes.
 - b. Submit test reports within 24 hours of performing tests.
 5. Verify that concrete-curing compounds that impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions.
1. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
1. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. and allow primer to dry.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
 - 1. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 deg F.
- D. Installation Over Concrete Decks:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - b. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is not restricted.
 - c. Fill gaps exceeding 1/4 inch with insulation.
 - d. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - e. Adhere base layer of insulation to concrete roof deck in accordance with manufacturer's written instructions and the Florida Product Approval.
 - 2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Adhere each layer of insulation to substrate using adhesive according to manufacturer's written instructions
- E. Installation Over Wood Decking:
 - 1. Mechanically fasten sheathing paper to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.
 - a. Lap edges a minimum of 2 inches, or as recommended by roof membrane manufacturer.
 - b. Lap ends a minimum of 6 inches, or as recommended by roof membrane manufacturer.
 - c. Fasten sheathing paper according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
 - d. Fasten sheathing paper to resist specified uplift pressure at corners, perimeter, and field of roof.
 - 2. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - b. Make joints between adjacent insulation boards not more than 1/4 inch in width.

- c. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is not restricted.
 - d. Fill gaps exceeding 1/4 inch with insulation.
 - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - f. Adhere each layer of insulation to substrate using adhesive according to manufacturer's written instructions and the Florida Product Approval.
3. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation, so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Adhere each layer of insulation to substrate using adhesive according to manufacturer's written instructions

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board, so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 - a. Adhere base layer of insulation to concrete roof deck in accordance with manufacturer's written instructions and the Florida Product Approval.

3.6 INSTALLATION OF ROOFING MEMBRANE, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Install roofing sheets parallel with slope.
- D. Coordinate installation of roofing system, so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement, with joints and edges sealed.
 - 2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.7 INSTALLATION OF BASE SHEET

- A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.
- B. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.

- C. Installation of APP-Modified Polyester and Fiberglass-Mat Base Sheet:
1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
 2. Extend roofing sheets over and terminate above cants.
 3. Install base sheet in a shingle fashion.
 4. Adhere base sheet to insulation in accordance with manufacturer's written instructions and the Florida Product Approval.
 5. Install base sheet without wrinkles, rears, and free from air pockets.
 6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
 - a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 - b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 - c. Stagger end laps not less than 18 inches.
 - d. [Heat weld end laps,] [Completely bond and seal laps,] leaving no voids.
 - e. Roll laps with a 20-pound roller.
 7. Repair tears and voids in laps and lapped seams not completely sealed.
 8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.8 INSTALLATION OF APP-MODIFIED BITUMINOUS MEMBRANE

- A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.
- B. Install polymer-modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
1. Extend cap sheet over and terminate above cants.
 2. Install cap sheet in a shingle fashion.
 3. Install cap sheet as follows:
 4. Adhere to substrate in a uniform coating of cold-applied adhesive.
 5. Install cap sheet without wrinkles or tears, and free from air pockets.
 6. Install cap sheet, so side and end laps shed water.
- C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
1. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
 2. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches.
 3. Stagger end laps not less than 18 inches.
 4. Heat weld end laps, leaving no voids.
 5. Roll laps with a 20-pound roller.
 6. Repair tears and voids in laps and lapped seams not completely sealed.
- D. Apply pressure to the body of the cap sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.9 INSTALLATION OF FLASHING AND STRIPPING

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions and as follows:
1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 2. Backer Sheet Application:
 - a. Adhere backer sheet over roofing membrane at cants in cold-applied adhesive.
 - b. Seal all laps.

3. Backer Sheet Application:
 - a. Adhere backer sheet to substrate in cold-applied adhesive.
4. Flashing Sheet Application: Torch apply flashing sheet to substrate.
 - a. Perform torch application according to NFPA 241, including two-hour fire watch after torches have been extinguished.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
 1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.
- D. Install liquid flashing system according to manufacturer's recommendations.
 1. Extend liquid flashing not less than 3 inches in all directions from edges of item being flashed.
 2. Embed granules, matching color of roof membrane, into wet compound.
- E. Install roofing cap sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- F. Roof Drains: Set 30-by-30-inch 4-pound lead flashing in bed of asphaltic adhesive on completed roofing membrane.
 1. Cover lead flashing with roofing cap sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane.
 2. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 3. Install stripping according to roofing system manufacturer's written instructions.

3.10 INSTALLATION OF WALKWAYS

- A. Walkway Pads: Install walkway pads, using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
 1. Install walkways where indicated on the Drawings and as required by roof membrane manufacturer's warranty requirements.
 2. Provide 3-inch clearance between adjoining pads.
 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: The Contractor shall engage a third party certified operator to provide an audit using infrared imaging or nuclear scanning. Scan shall include photographic or thermographic images of all areas of the roof surface and unexplained anomalies. Where moisture is suspected, the Roofing Installer shall, at his expense, confirm or dismiss the finding by way of sampling and shall make corrections required.
- B. Perform the following tests:
 1. Low-Voltage Electrical Conductance Testing: Testing agency shall survey entire roof area and flashings to locate discontinuity in the roof membrane using an exposed metal electrical loop to create an electrical field tested with hand-held probes or a scanning platform having integral perimeter electrical loops creating a complete electrical field.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.
 2. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.
- C. Test Cuts: Remove test specimens to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Determine approximate quantities of components within roofing membrane according to ASTM D3617/D3617M.
 2. Examine test specimens for interply voids according to ASTM D3617/D3617M and to comply with criteria established in Appendix 3 in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
 3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.
- D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- F. Roofing system will be considered defective if it does not pass tests and inspections.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

3.13 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: The City of Tampa
 2. Address: 315 East Kennedy Boulevard, Tampa, Florida 33602
 3. Building Name/Type: Administration Building
 4. Address: David L. Tippin Water Treatment Facility
 5. Area of Work: <Insert information>.
 6. Acceptance Date: _____.
 7. Warranty Period: Two Years.
 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 158 mph;
 - c. fire;

- d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 52 13

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed roof-drainage sheet metal fabrications.
 - 2. Formed low-slope roof sheet metal fabrications.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, cants, and blocking.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, , and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details of termination points and assemblies.
 - 6. Include details of roof-penetration flashing.
 - 7. Include details of special conditions.
 - 8. Include details of connections to adjoining work.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Approval: For each roofing system provide the following:

1. Proof that the system/products comply with Florida Product Approval Rule 9B-72.
 2. Installation instructions showing how the system/products are to be installed.
- B. Qualification Data: For fabricator.
- C. Product Certificates: For each type of copings and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- D. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- E. Sample Warranty: For special warranty.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- 1.8 QUALITY ASSURANCE
- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120. Identify materials with name of fabricator and design approved by FM Approvals.
- E. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
1. Design Pressure: As indicated on Drawings.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg , ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
 1. Nonpatinated Exposed Finish: Mill.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
 1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide GCP Applied Technologies Inc. (formerly Grace Construction Products); Grace Ice & Water Shield HT or a comparable product by one of the following:
 - a. Henry Company.
 2. Thermal Stability: Stable after testing at 240 deg F according to ASTM D 1970/D 1970M.
 3. Low-Temperature Flexibility: Passes after testing at minus 20 deg F according to ASTM D 1970/D 1970M.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 2. Fasteners for Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- B. Solder:
 1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 2. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- E. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Flashing shall be copper; stainless steel is acceptable for concealed flashings.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Obtain field measurements for accurate fit before shop fabrication.
 - 4. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Downspouts:
 - 1. Fabricate new downspouts to match existing, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 2. Fabricated Hanger Style: Match existing.
 - 3. Manufactured Hanger Style: Match existing.
 - 4. Hanger Style: Match existing.
 - 5. Fabricate from the following materials:
 - a. Copper: 16 oz./sq. ft..
- B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from one of the following materials:
 - 1. Copper: 16 oz./sq. ft.
- C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge, to match existing historic units. Fabricate from the following materials:
 - 1. Copper: 16 oz./sq. ft.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing: Fabricate in minimum 96-inch long, but not exceeding 12-foot long sections. Furnish with 6-inch wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch wide, exposed cover plate.
 2. Fabricate from the Following Materials:
 - a. Copper: 20 oz./sq. ft..
 - b. Stainless Steel: 0.019 inch thick.
- B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
- a. Copper: 16 oz./sq. ft.
 - b. Stainless Steel: 0.019 inch thick.
- C. Flashing Receivers: Fabricate from one of the following materials:
1. Copper: 16 oz./sq. ft.
 2. Stainless Steel: 0.016 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
1. Copper: 16 oz./sq. ft..
 2. Stainless Steel: 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 30 days.
- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Replace existing non-copper downspouts with new copper gutters and downspouts to match existing.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 4. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 5. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 6. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fasteners: Use fastener sizes that penetrate wood blocking not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not use torches for soldering.
 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 3. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
- 3.4 ROOF-DRAINAGE SYSTEM INSTALLATION
- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

2. Provide elbows at base of downspout to direct water away from building.
- C. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
 2. Loosely lock front edge of scupper with conductor head.
- D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Silyl-terminated polyether joint sealants.
 - 3. Mildew-resistant joint sealants.
 - 4. Latex joint sealants.
- B. Related Requirements:
 - 1. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.4 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.3 SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS

- A. STPE, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
- C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces.

1. Joint Sealant: Silicone or STPE, nonstaining, S, NS, 50, NT.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement, unless otherwise indicated.

1. Joint Sealant: Acrylic latex.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints.
2. Joint Sealant: Silicone or STPE, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.

2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 19

SECTION 08 03 52 - HISTORIC TREATMENT OF WOOD WINDOWS

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of wood windows in the form of the following:
 - 1. Repairing interior wood windows (borrow lites) and trim.
 - 2. Reglazing.
 - 3. Repairing, refinishing, and replacing hardware.
- B. Related Requirements:
 - 1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.

1.3 DEFINITIONS

- A. Glazing: Includes glass, glazing points, glazing tapes, glazing sealants, and glazing compounds.
- B. Window: Includes window frame, sash, hardware, storm window, and exterior and interior shutters unless otherwise indicated by context.
- C. Wood Window Component Terminology: Wood window components for historic treatment work include the following classifications:
 - 1. Frame Components: Head, jambs, and sill.
 - 2. Sash Components: Stiles and rails, parting bead, stop, and muntins.
 - 3. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
 - 4. Interior Trim: Casing, stool, and apron.

1.4 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of wood windows in the following sequence, which includes work specified in this and other Sections:
 - 1. Clean surfaces.
 - 2. General Wood-Repair Sequence:
 - a. Remove paint to bare wood.
 - b. Rack frames slightly to inject adhesive into mortise and tenon joints; square frames to proper fit before adhesive sets.
 - c. If thicker than original glass is required, rout existing muntins to required rebate size.
 - d. Repair wood by consolidation, member replacement, partial member replacement, and patching.
 - e. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
 - 3. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
 - 4. Install glazing.
 - 5. Reinstall units.
 - 6. Apply finish coats.
 - 7. Install remaining hardware.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

- B. Samples for Initial Selection: For each type of exposed wood and finish.
 - 1. Identify wood species, cut, and other features.
 - 2. Include Samples of hardware and accessories involving color selection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist including workers.
- B. Wood Window Historic Treatment Program: Submit before work begins.

1.7 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood window specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part. Experience only in fabricating and installing new wood windows is insufficient experience for wood-window historic treatment work.
- B. Wood Window Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- C. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups on existing windows where directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or Accoya.

2.3 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Abatron, Inc.
 - b. ConServ Epoxy LLC.
 - c. Gougeon Brothers, Inc.
 - d. Protective Coating Company.
 - e. System Three Resins, Inc.
- C. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Abatron, Inc.
 - b. Advanced Repair Technology, Inc.
 - c. ConServ Epoxy LLC.
 - d. Gougeon Brothers, Inc.
 - e. Polymeric Systems, Inc.
 - f. Protective Coating Company.
 - g. System Three Resins, Inc.

2.4 GLAZING MATERIALS

- A. Glass: Clear annealed float glass units according to Section 08 80 00 "Glazing."
- B. Glazing Systems:
 - 1. Traditional Glazing Products: Glazing points and oil-based glazing putty or latex glazing compound. Tint to required color according to manufacturer's written instructions.
 - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.
 - b. DAP Products Inc.
 - c. Sarco Putty Company, Inc.
 - d. United Gilsonite Laboratories (UGL).
 - 3. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.5 HARDWARE

- A. Replacement Hardware: Replace existing damaged or missing hardware with new hardware.
- B. Material and Design:
 - 1. Design: Match type and appearance of existing hardware.

2.6 MISCELLANEOUS MATERIALS

- A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed

wood from further damage by decay fungi and wood-boring insects; complying with AWWA P5; containing no boric acid.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Nisus Corporation.
 - b. System Three Resins, Inc.

B. Cleaning Materials:

1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

C. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.

1. Match existing fasteners in material and type of fastener unless otherwise indicated.
2. Use concealed fasteners for interconnecting wood components.
3. Use concealed fasteners for attaching items to other work unless exposed fasteners are the existing fastening method.
4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
5. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

D. Anchors, Clips, and Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B633 for SC 3 (Severe) service condition.

2.7 WOOD WINDOW FINISHES

- A. Unfinished Replacement Units: Provide exposed wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic treatment of wood windows include, but are not limited to, the following:
 1. Specialized Services Group

3.2 PREPARATION

- A. Protect adjacent materials from damage by historic treatment of wood windows.
- B. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.3 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from the window interior at 5 feet away
- B. General: In treating historic items, disturb them as minimally as possible and as follows:

1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 09 03 91 "Historic Treatment of Plain Painting" unless otherwise indicated.
 3. Repair items in place where possible.
 4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
 5. Refinish historic wood windows according to Section 09 03 91 "Historic Treatment of Plain Painting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood Windows: Match existing materials and features, retaining as much original material as possible to perform repairs.
1. Unless otherwise indicated, repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 2. Where indicated, repair wood windows by limited replacement matching existing material.

3.4 WOOD WINDOW PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids, and that have limited amounts of rotted or decayed wood.
1. Verify that surfaces are sufficiently clean and free of paint residue before patching.
 2. Treat wood members with wood consolidant before applying patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Allow treatment to harden before filling void with patching compound.
 3. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
 3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 5. Clean spilled compound from adjacent materials immediately.

3.5 WOOD WINDOW MEMBER-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood window members at locations where damage is too extensive to patch.
1. Verify that surfaces are sufficiently clean and free of paint residue before repair.
 2. Remove broken, rotted, and decayed wood down to sound wood.

3. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 4. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- D. Clean spilled materials from adjacent surfaces immediately.
- E. Glazing: Reglaze units before reinstallation.
1. Mill new and rout existing glazed members to accommodate new glass thickness.
 2. Provide replacement glazing stops coordinated with glazing system indicated.
 3. Provide glazing stops to match contour of sash frames.
- F. Reinstall units removed for repair into original openings.

3.6 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, glazing systems, and glazing materials, unless more stringent requirements are indicated.
- B. Remove cracked and damaged glass and glazing materials from openings and prepare surfaces for reglazing.
- C. Remove glass and glazing from openings and prepare surfaces for reglazing.
- D. Size glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.
- E. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.
- F. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.
- G. Install glazing points.
- H. Disposal of Removed Glass: Remove from Owner's property and legally dispose of it.

3.7 ADJUSTING

- A. Adjust existing and replacement operating sash, hardware, and accessories for a tight fit at contact points for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.8 CLEANING AND PROTECTION

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. Monitor window surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact window surfaces, remove contaminants immediately.
- B. Clean exposed surfaces immediately after historic treatment of wood windows. Avoid damage to coatings and finishes. Remove excess sealants, glazing and patching materials, dirt, and other substances.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction.

END OF SECTION 08 03 52

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware and raceways for electrified hardware and access control.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Approval: For each type exterior door and frame provide the following:
 - 1. Proof that the system/products comply with Florida Product Approval Rule 9B-72.
 - 2. Installation instructions showing how the system/products are to be installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Product Approval: Exterior door and frame systems/products that are incorporated into the Work shall comply with Florida Product Approval Rule 9B-72.
- B. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Temperature-Rise Limit: At vertical exit enclosures and exit passageway, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- C. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone
 - 1. Large-Missile Test: For glazed openings located within 30 feet of grade.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.
 - 1. Doors:
 - a. Thickness: 1-3/4 inches.
 - b. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch.
 - c. Edge Construction: Model 2, Seamless.
 - d. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - e. Core: Polystyrene or Polyurethane or Polyisocyanurate.
 - f. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B.
 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A60 coating.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Polystyrene or Polyurethane or Polyisocyanurate.
 - i. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated doors.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
 - b. Construction: Full profile welded.
 3. Exposed Finish: Prime.

2.4 BORROWED LITES

- A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.042 inch.
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.

3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.7 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- B. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- C. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- D. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- E. Glazing: Comply with requirements in Section 08 80 00 "Glazing."
- F. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 FABRICATION

- A. Doors
1. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 2. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 3. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 4. Doors with Electrified Hardware: Provide electrified lock wiring harness and concealed plug connectors on both ends to accommodate up to twelve wires. Coordinate electrified lock connectors on end of the wiring harness to plug directly into the electrified hardware and the electric hinge. Maintain fire rating requirements at rated openings.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 - 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 - 3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames according to NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
- 3.3 CLEANING AND TOUCHUP
- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
 - B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
 - C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware and raceways for electrified hardware and access control.
- B. Related Requirements:
 - 1. Section 08 80 00 "Glazing" for glass view panels in non-rated flush wood doors.
 - 2. Section 08 80 13 "Fire Resistant Glazing" for glass view panels in fire rated flush wood doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 - 2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
 2. Eggers Industries.
 3. Graham Wood Doors; an Assa Abloy Group company.
 4. Ipik Door Company.
 5. Masonite Architectural.
 6. Mohawk Flush Doors, Inc.
 7. Oshkosh Door Company.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
- E. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

- a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-by-10-inch lock blocks, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
- a. Screw-Holding Capability: 475 lbf per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select white birch or Select white maple or Red oak or White oak.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
9. Core: Structural composite lumber.
10. Construction: Five. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Recessed tapered beads.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Doors with Electrified Hardware: Provide Molex wiring harness and concealed plug connectors on both ends to accommodate up to twelve wires. Coordinate Molex connectors on end of the wiring harness to plug directly into the electrified hardware and the electric hinge. Maintain fire rating requirements at rated openings.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: AWI's, "Architectural Woodwork Standards" System 9, UV curable, acrylated epoxy, polyester, or urethane.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Open-grain finish.
 5. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

SECTION 08 34 83 - FLOOR DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes floor doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details materials, individual components and profiles, and finishes.

PART 2 - PRODUCTS

2.1 ALUMINUM FLOOR DOORS

- A. Angle Frame Aluminum Floor Door:
 - 1. Frame: Mill finish aluminum, angle profile.
 - 2. Door: Single leaf; 1/4-inch-thick smooth mill-finish aluminum plate.
 - 3. Loading Capacity: 150-lbf/sq. ft. pedestrian live load.
 - 4. Hardware:
 - a. Material and Finish: Type 316 stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and brackets, hinges, pins, and fasteners.
 - b. Hinges: Heavy-duty butt hinges with stainless steel pins.
 - c. Operating Mechanism: Adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with vinyl grip that allows for one-handed closure, and recessed lift handle.
 - d. Latch: Stainless steel slam latch.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
- B. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- C. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

- A. General: Provide floor doors manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure floor doors to types of supports indicated.

- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor doors.

3.3 FIELD QUALITY CONTROL

- A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

3.4 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 34 83

SECTION 08 42 13 - ALUMINUM-FRAMED ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual-swing entrance doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 4. Include point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
 - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Approval: For each type exterior Aluminum-Framed Entrance and Storefront provide the following:
 - 1. Proof that the system/products comply with Florida Product Approval Rule 9B-72.
 - 2. Installation instructions showing how the system/products are to be installed.
- B. Qualification Data: For Installer.
- C. Product Test Reports: For aluminum-framed entrances.
- D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kawneer North America, an Arconic company.
 - 2. Oldcastle Building Envelope™.
 - 3. U.S. Aluminum; a brand of C.R. Laurence.
 - 4. YKK AP America Inc.
- B. Source Limitations: Obtain all components of aluminum-framed entrance, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Systems / products that are incorporated into the Work shall comply with Florida Product Approval Rule 9B-72.
- B. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
- C. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 2 for basic protection.
 - 1. Large-Missile Test: For glazing located within 30 feet of grade.
- D. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
 - 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Wide stile; 5-inch nominal width.
 - 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
- B. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: 1-3/4 by 4-1/2 inches.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
 - c. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
 - d. Structural Profiles: ASTM B308/B308M.
 - 2. Steel Reinforcement:
 - a. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

2.5 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads finished to match framing system, fabricated from 300 series stainless steel.

- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, complying with ASTM A240/A240M, of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- E. Rigid PVC Filler.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. Provide compression weather stripping at fixed stops.
- E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. Provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. Provide weather sweeps applied to door bottoms.
- F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: White, high gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

- D. Install components plumb and true in alignment with established lines and grades.

- E. Install glazing as specified in Section 08 80 00 "Glazing."

- F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing:

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
2. Air Infiltration: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

- C. Aluminum-framed entrances will be considered defective if they do not pass tests and inspections.

END OF SECTION 08 42 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.
- B. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - 2. Cylinders for door hardware specified in other Sections.
- C. Related Requirements:
 - 1. Section 06 41 16 "Plastic-Laminate-Clad Architectural Cabinets" for cabinet door hardware provided with cabinets.

1.3 DESCRIPTION OF WORK

- A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.
- B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.
- C. Hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.
- D. Fire-rated openings:
 - 1. Provide hardware for fire-rated openings in compliance with A.I.A. (NBFU) Pamphlet No. 80, NFPA Standards NO. 101, UBC 702 (1997) and UL10C. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required and complies with the requirements of the door and door frame labels. 2. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating "Fire Exit Hardware".
- E. Fasteners:
 - 1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
 - 2. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.
 - 3. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.
 - 4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).

- G. Exterior openings
 - 1. Provide hardware for hurricane openings in compliance with local jurisdiction. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by local authority for the types and sizes of doors required and complies with the requirements of the door and door frame. Coordinate Section Finish Hardware with the Hollow Metal Doors and Frames and Aluminum Doors and Frames.

1.4 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Fastenings and other installation information.
 - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - f. Mounting locations for door hardware.
 - g. List of related door devices specified in other Sections for each door and frame.
- C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For each type of electrified door hardware.
 - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Catalogs or cut sheets for each type of door hardware to include in maintenance manuals. Include the following:
 - 1. Final hardware schedule
 - 2. Final keying schedule
 - 3. Elevation drawing and point-to-point wiring diagrams of each electrified opening.
- B. Schedules: Final door hardware and keying schedule.

1.8 QUALITY ASSURANCE

- A. The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the Architect, Owner and the General Contractor at reasonable times during the course of work.
- B. The finish hardware supplier shall prepare and submit to the Architect a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. Submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.
- C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.
- D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.
- E. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.
- F. The hardware manufactures are to supply both a pre-installation class as well as a post-installation walk-thru. This is to insure proper installation and provide for any adjustments or replacements of hardware as required.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Wrap, protect finish hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.10 WARRANTY

- A. The material furnished shall be warranted for one year after installation or longer as the individual manufacturer's warranty permits.
- B. The manufacturer shall warrant against failure due to defective materials and workmanship and shall warrant overhead door closers in writing for a period of ten (10) years. Commencing on

the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. To the greatest extent possible, obtain each kind of hardware from only one manufacturer.
- B. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers.

PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
1. Hinges	Ives	Hager, Stanley, Bommer
2. Locks & Latches	Schlage Locks	None (Owners Standard)
3. Exit Devices	Von Duprin	None (Owners Standard)
4. Door Closers	LCN	None (Owners Standard)
5. Wall Stops/Floor Stops, Flushbolts	Ives	Rockwood, Hager
6. Kick Plates	Ives	Rockwood, Hager
7. Threshold/Weather-strip	National	Guard Pemko, Zero
8. Silencers	Ives	Rockwood, Hager
9. Key Cabinet	Lund Key Control	

- C. If material manufactured by other than that specified or listed herewith as an equal, is to be bid upon, permission must be requested from the architect seven (7) days prior to bidding. If substitution is allowed, it will be so noted by addendum.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the Florida Building Code – Accessibility.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
 - 5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
 - 1. Door hardware is scheduled in Part 3.

2.4 HINGES AND PIVOTS

- A. Exterior butts shall be Stainless Steel. Butts on all out-swinging doors shall be furnished with non-removable pins (NRP).
- B. Interior butts shall be as listed.
- C. Doors 5' or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2'6" in height or fraction thereof.

2.5 KEYING:

- A. Equip locks and cylinders with Schlage Everest cylinders.
- B. All bittings shall be issued by lock manufacture per Owners instructions.
- C. Provide Two (2) each change keys per lock and Six (6) each grand master, master keys, two (2) construction and two (2) permanent control keys.
- D. Hardware supplier to provide temporary cylinders or cores during the construction phase. The contractor is to change out the temporary cylinders for the permanent cylinders.

2.6 LOCKSETS

- A. Locksets shall be Heavy Duty type, unless specified otherwise, in "L" and "ND" Series, Lever designs as manufactured by Schlage Lock Company.
- B. Lock Functions: As indicated in door hardware schedule.
- C. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch bolt throw.
- D. Lock Backset: 2-3/4 inches unless otherwise indicated.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

2.7 EXIT DEVICES

- A. Exit devices shall be Von Duprin 98 Series in types and functions specified. All devices must be listed under "Panic Hardware" in accident equipment list of Underwriters Laboratories. All labeled doors with "Fire Exit Hardware" must have labels attached and be in strict accordance with Underwriters Laboratories.
- B. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles must be provided.
- C. Surface strikes shall be roller type and come complete with a plate underneath to prevent movement. And shall be provided with a dead-latching feature to prevent latch bolt tampering.

2.8 DOOR CLOSERS

- A. Closers shall be LCN 4000 Series having non-ferrous covers, forged steel arms separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arm mounted on all

doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.

- B. Door closer cylinders shall be of high strength cast iron construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
- C. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 and UL 10C.
- D. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage. Pressure relief valves (PRV) are not acceptable.

2.9 TRIM AND PLATES:

- A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 10" high, mop plates to be 4" high. All plates shall be two (2) inches less full width of door.
- B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

2.10 DOOR STOPS:

- A. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives WS407 Series are preferred, but where not practical furnish floor stops equal to Ives FS436 or FS438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 Series.

2.11 THRESHOLDS AND WEATHERSTRIP:

- A. Thresholds and weather-strip shall be as listed in the hardware schedule.

2.12 DOOR SILENCERS:

- A. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.
- B. Provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

- C. No hardware is to be installed until the hardware manufactures have provided a pre-installation class to insure proper installation of the specified products. A post installation inspection by a manufacturer’s representative will be provided to insure proper installation.

3.3 ADJUSTING AND CLEANING

- A. Adjust all hardware in strict compliance with manufacturer’s instructions.
- B. Prior to turning project to Owner, clean and make any final adjustments to the finish hardware.

3.4 PROTECTION

- A. Protect the hardware, as it is stored on construction site in a covered and dry place.
- B. Protect exposed hardware installed on doors during the construction phase.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
 - 3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 KEY CABINET

- A. Set up and index one (1) Key Cabinet that allows room for expansion for 150% of the number of keys for the project.

3.8 DOOR HARDWARE SCHEDULE:

- A. The hardware sets represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality. Quantities listed are for each pair of doors or for each single door.

3.9 DOOR HARDWARE SCHEDULE

- A. Abbreviations:

Manufacturer	Finishes
IVE - Ives	626 Satin chrome plated
LCN - LCN	628 Satin Aluminum
SCH - Schlage	630 Satin stainless steel
VON – Von Duprin	652 Satin chrome plated
SCH - Schlage	689 Aluminum painted
ZER - Zero International, Inc	AL Aluminum

B/O – By Owner BK Black

B. **Hardware** Group No. 01

Provide each of doors with the following: 100

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10 CON	↗	689	VON
1	EA	FIRE EXIT HARDWARE	HH-9847-EO-F-SNB		626	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-HH-9847-NL-OP-F-110MD-CON-SNB-24VDC	↗	626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
2	EA	90 DEG OFFSET PULL	8190EZHD 10" O		630-316	IVE
2	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	THRESHOLD	65A-223		A	ZER
1	EA	WIRE HARNESS	CON-32			SCH
1	EA	WIRE HARNESS	CON-6W			SCH
1	EA	POWER SUPPLY	PS902 900-2RS	↗	LGR	SCE

Card Reader and Power supply by security sub to release trim for access, free egress. Balance of hardware by aluminum supplier.

Hardware Group No. 02

Provide each of doors the following: 123B

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
1		EXISTING DOOR, FRAME AND HARDWARE TO REMAIN				

C. **Hardware** Group No. 03

Provide each single with the following: 101

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10 CON	↗	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-QEL-HH-9847-NL-OP-F-110MD-CON-SNB-24VDC	↗	626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O		630-316	IVE
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	THRESHOLD	65A-223		A	ZER
1	EA	WIRE HARNESS	CON-32			SCH
1	EA	WIRE HARNESS	CON-6W			SCH

Card Reader and Power supply by security sub to release trim for access, free egress. Balance of hardware by aluminum supplier.

D. **Hardware** Group No. 03A

Provide each single with the following: 210B

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
2	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	ELEC HINGE	5BB1 4.5 X 4.5 CON TW8	↗	630	IVE
1	EA	ELEC FIRE EXIT HARDWARE	98-L-E996-LAT-FSE-CON	↗	626	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	THRESHOLD	65A-223		A	ZER
1	EA	WIRE HARNESS	CON-32			SCH
1	EA	WIRE HARNESS	CON-6W			SCH

Card Reader and Power supply by security sub to release trim for access, free egress.

- E. Hardware Group No. 04
Provide each single door the following: 112, 124

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	L9080P LATA		626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	THRESHOLD	65A-223		A	ZER

- F. Hardware Group No. 05
Provide each of doors the following: 212A, 215

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
8	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
2	EA	MANUAL FLUSH BOLT	FB458		626	IVE
1	EA	STOREROOM LOCK	L9080P LATA		626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
2	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

- G. Hardware Group No. 06
Provide each single with the following: 000A, 000B

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	98-L-BE-LAT		626	VON
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7830	↗	689	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER

- H. Hardware Group No. 07
Provide each single with the following: 103, 104, 105A, 105B, 107, 109, 120, 122, 201, 202, 203A, 203B, 205, 206, 207, 209B, 220

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 CON TW8	↗	652	IVE
1	EA	EU MORTISE LOCK	L9092PEU LATA RX CON	↗	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	WIRE HARNESS	CON-32			SCH
1	EA	WIRE HARNESS	CON-6W			SCH

Card Reader and Power supply by security sub to release lock for access, free egress

- I. Hardware Group No. 08
Provide each single with the following: 110A, 110B

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
1	EA	CONT. HINGE	224XY		628	IVE
1	EA	STOREROOM LOCK	L9080P LATA		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

- J. Hardware Group No. 09
Provide each single with the following: 103A, 111, 119, 121, 212B, 216

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080P LATA		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

- K. Hardware Group No. 10
Provide each single with the following: 117

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	L9070P LATA		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

- L. Hardware Group No. 10A
Provide each single door with the following: 209A

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 LATA		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

- M. Hardware Group No. 11
Provide each single with the following: 204

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	OFFICE/ENTRY LOCK	L9050P LATA		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

N. Hardware Group No. 12
Provide each single with the following: 118, 211, 214

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	L9040 LATA L583-363 L283-722		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

O. Hardware Group No. 13
Provide each single with the following: 113, 115, 123A, 210A

QTY		DESCRIPTION	CATALOG NUMBER	ITEMID	FINISH	MFR
4	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	L9010 LATA		626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA		689	LCN
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites, storefront framing.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 88 13 "Fire-Resistant Glazing."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. FBC: Florida Building Code.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.
 1. Design Wind Pressures: As indicated on Drawings.
 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
- C. Windborne-Debris Impact Resistance: Exterior glazing shall pass ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 2 for basic protection.
 1. Large-Missile Test: For glazing located within 30 feet of grade.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated)
- C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:
 - 1. Polyvinyl butyral interlayer.

2.6 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
1. EPDM or Neoprene with a Shore A durometer hardness of 85, plus or minus 5.
- D. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 2. Type recommended by sealant or glass manufacturer.
- E. Edge Blocks:
1. EPDM or Neoprene with a Shore A durometer hardness per manufacturer's written instructions.
 2. Type recommended by sealant or glass manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Presence and functioning of weep systems.
 3. Minimum required face and edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-1: Clear annealed float glass.
 - 1. Minimum Thickness: 6 mm.
- B. Glass Type GL-2: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.9 LAMINATED GLASS SCHEDULE

- A. Glass Type GL-3: Clear laminated glass with two plies of annealed, heat-strengthened or fully tempered float glass.
 - 1. Minimum Thickness of Each Glass Ply: 5 mm.
 - 2. Interlayer Thickness: 0.090 inch.

END OF SECTION 08 80 00

SECTION 08 88 13 - FIRE-RESISTANT GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-resistance-rated glazing.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of glass and glazing product, from manufacturer.
- B. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

- A. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 FIRE-RESISTANCE-RATED GLAZING (FR)

- A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.
- B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Pilkington North America ; Pyrostop. or a comparable product by one of the following:
 - a. Technical Glass Products.

2.5 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
 1. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.6

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 88 13

SECTION 09 03 20 - HISTORIC TREATMENT OF PLASTER

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Repair and replacement of interior gypsum plaster.
- B. Related Requirements:
 - 1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood framing, grounds, and furring that support lath and plaster.
 - 3. Section 09 03 91 "Historic Treatment of Plain Painting" for paint removal, surface preparation for refinishing, and refinishing of historic plaster surfaces.
 - 4. Section 09 22 16 "Non-Structural Metal Framing" for non-load-bearing steel framing and furring that support lath and plaster.
 - 5. Section 09 26 13 "Gypsum Veneer Plastering" for gypsum-based veneer plaster applied on gypsum base for veneer plaster, unit masonry, and monolithic concrete.

1.3 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of plaster in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware that overlie plaster surfaces except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of plaster surfaces.
 - 4. Clean plaster surface and remove paint and other finishes to the extent required.
 - 5. Repair and replace existing plaster and supports to the degree required for a uniform, tightly adhered surface on which to paint or apply other finishes.
 - 6. Cure repaired surfaces and allow them to dry for proper finishing.
 - 7. Paint and apply other finishes.
 - 8. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use.

1.5 QUALITY ASSURANCE

- A. Plasterwork Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work and protection of surrounding materials and Project site.
- B. Mockups: Prepare mockups of historic treatment processes for each type of plaster repair and reconstruction work to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.

1. Locate mockups in locations that enable viewing under same conditions as the completed Work.
2. Number and Size: Two wall surfaces of at least 10 sq. ft. to represent surfaces and conditions for application of each type of plaster repair and reconstruction under same conditions as the completed Work. Include at least the following:
 - a. Patch wall area of wet-applied plaster replacement.
 - b. Repair 3 linear ft. of plaster cracks.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- B. Store materials on elevated platforms, under cover, and in a dry location with ambient temperatures continuously maintained at not less than 45 deg F.
- C. Store hydrated lime and factory-prepared lime putty in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- D. Store materials not in use in tightly covered containers.
- E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.7 FIELD CONDITIONS

- A. Comply with plaster-material manufacturers' written instructions. For gypsum plaster, also comply with ASTM C 842 requirements.
- B. Temperatures: Maintain temperatures in work areas at not less than 55 deg F or greater than 80 deg F for at least seven days before application of plaster, continuously during application, and for seven days after plaster has set or until plaster has dried.
- C. Conditioning: Acclimatize cast-plaster fabrications to ambient temperature and humidity of spaces in which they are installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.
- D. Field Measurements: Where cast-plaster fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- E. Avoid conditions that result in plaster drying out too quickly.
 1. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 2. Maintain relative humidity levels for prevailing ambient temperature that produce normal drying conditions.
 3. Ventilate work areas in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 GYPSUM PLASTER MATERIALS

A. Gypsum Materials:

1. Lightweight Gypsum Ready-Mixed Plaster: ASTM C 28/C 28M, with mill-mixed perlite aggregate.
2. Gypsum Neat Plaster: ASTM C 28/C 28M for use with job-mixed aggregates.
3. High-Strength Gypsum Neat Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 2800 psi per ASTM C 472 for a mix of 100 lb of plaster and 2 cu. ft. of sand.
4. Gypsum Gaging Plaster. ASTM C 28/C 28M.
5. High-Strength Gypsum Gaging Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 5000 psi per ASTM C 472 for a neat mix.
6. Gypsum Ready-Mixed Finish Plaster: ASTM C 28/C 28M; manufacturer's standard, mill-mixed, gaged, interior finish.
7. Gypsum Keene's Cement: ASTM C 61/C 61M.

B. Hydrated Lime: ASTM C 206, Type S or Type N.

C. Aggregates:

1. Aggregate for Base-Coat Plasters: ASTM C 35, sand.
2. Aggregate for Float Finishes: ASTM C 35, sand; graded per ASTM C 842.

D. Fiber: 1/2 to 1 inch in length; composed of cattle, goat, or hog hair or body hair from horses or alkali-resistant glass or polypropylene fiber; free of grease, waxes, and oils; and beaten well to separate fibers before blending into unfibered plaster material.

1. Proportion of Fiber to Unfibered Plaster Material: 3.5 oz./cu. ft. of unfibered plaster material, adjusted as required to produce a well-fibered, cohesive, spreadable, stiff mix with fibers uniformly distributed.

E. Bonding Compound: ASTM C 631.

2.2 TRIM ACCESSORIES

A. General: According to ASTM C 841 for gypsum plaster; coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
2. Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
3. Cornerbeads: Fabricated from zinc.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
4. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fasteners for Attaching Lath to Substrates:

1. For Gypsum Plaster: ASTM C 841.

- C. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Little possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave an unintended residue on surfaces.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT OF PLASTER, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from surface.
- B. General: In treating historic plaster, disturb it as minimally as possible and as follows unless otherwise indicated:
 - 1. Dismantle loose, damaged, or deteriorated plaster, lath, and support systems that cannot be repaired.
 - 2. Verify extent of plaster deterioration against that indicated on Drawings. Consult Architect on types and extent of required work.
 - 3. Verify that substrate surface conditions are suitable for repairs.
 - 4. Provide lath, furring, and support systems for plaster included in the work of this Section.
 - 5. Replace lost details in new, wet-applied and cast plaster that replicate existing or indicated plaster configurations.
 - 6. Leave repaired plasterwork in proper condition for painting or applying other finishes as indicated.
 - 7. Install temporary protective measures to protect historic surfaces that shall be treated later.
- C. Illumination: Perform plastering work with adequate, uniform illumination that does not distort the flatness or curvature of surfaces.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate and environmental conditions, installation tolerances, and other conditions affecting performance of the Work.
 - 1. If existing substrates cannot be prepared to an acceptable condition for plastering work, notify Architect in writing.
 - 2. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- B. Masonry Substrates: Verify that mortar joints are struck flush. Notify Architect of undocumented masonry substrate without flush joints. Proceed with plastering as directed by Architect.
- C. Begin historic plastering work only after unsatisfactory conditions have been corrected.

3.3 PREPARATION FOR PLASTERING

- A. Substrates: Prepare according to plaster manufacturer's written instructions and as follows:

1. Clean surfaces to remove dust, loose particles, grease, oil, incompatible curing compounds, form-release agents, and other foreign matter and deposits that could impair bond with plaster.
2. Remove ridges and protrusions greater than 1/8 inch and fill depressions greater than 1/4 inch with patching material. Allow to set and dry.

3.4 PLASTER REMOVAL AND REPLACEMENT, GENERAL

- A. Dismantle plaster that is damaged or deteriorated to the limits indicated. Carefully dismantle areas along straight edges that lie over supports, without damaging surrounding plasterwork.
- B. Maintain lath and supporting members in an undamaged condition so far as practicable. Dismantle damaged lath and supports that cannot be repaired or resecured and replace with new work of same type.
- C. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
- D. Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
- E. Clean substrate surfaces to remove grease, waxes, oils, waterborne staining, debris, and other foreign matter and deposits that could impair bond with repair material.
- F. Wet masonry and concrete bases before plaster application. Keep substrate damp to the touch but without visible water droplets.
- G. Wet remaining plaster abutting the replacement plaster before installing new plasterwork.
- H. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- I. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.5 FLAT GYPSUM-PLASTER REMOVAL AND REPLACEMENT

- A. General: Dismantle deteriorated plaster to existing sound plaster. Use replacement plaster mixes of gypsum, lime, and aggregate; and application according to ASTM C 842 unless otherwise indicated.
 1. Inspect for lath deterioration. If any, replace lath.
 2. Sand bonding surfaces of repair area, and clean the surface with a nonmetallic bristle brush.
 3. Wet substrate to damp condition, but without visible water droplets, then install new plaster to original profiles.
- B. Bonding Compound: Apply on unit masonry and concrete plaster bases.
- C. Gypsum-Plaster Base Coats:
 1. Base Coats over Expanded-Metal Lath: Gypsum neat plaster with job-mixed sand for scratch and brown coats. Add fiber to scratch coat.
 2. Base Coats over Unit Masonry: Gypsum neat plaster with job-mixed sand.
 3. Base-Coat Mix over Monolithic Concrete: Gypsum neat plaster with job-mixed sand.
- D. Gypsum-Plaster Finish Coats:
 1. Finish-Coat Mix for Smooth-Troweled Finishes: Gypsum gaging plaster, Gypsum ready-mixed finish plaster or Gypsum Keene's cement.
- E. Gypsum-Plaster Finishes: Match finish(es).

3.6 PATCH-TYPE REPAIR

- A. General: Patch voids, fractured surfaces, and crushed areas in otherwise sound plaster that are larger than cracks.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Inspect for deterioration of supporting plaster and lath, and repair or replace deteriorated material as required for a sound substrate.
 - 3. Rake perimeter of hole to sound plaster, and slightly undercut existing plaster to enable replacement plaster to tuck behind existing plaster.
 - 4. Replace missing lath in kind. Bridge gaps in wood lath with expanded-metal lath, overlapping wood by 6 inches and fastening them together.
 - 5. Clean hole to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, enlarge the hole to remove these deposits.
 - 6. Wet substrate to damp condition, but without visible water droplets, then install patch material to original profiles.
 - 7. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Gypsum-Plaster Mix: Gypsum neat plaster with job-mixed sand, applied in two coats with fiber in first coat. Add hair fiber to mix and evenly distribute it without clumps just before spreading.
- C. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.
- D. Hairline cracking within the plaster or plaster separation at edge of a patch is unacceptable. Completely dismantle such work and reinstall or repair.

3.7 HAIRLINE CRACK REPAIR

- A. General: Repair cracks 1/32 inch width or narrower in otherwise sound plaster.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Existing Topcoat: Open crack in existing topcoat to at least 1/8 inch in width and check for broken fiber reinforcement in base coats.
- C. Existing Base Coats: Do not open crack wider in existing base coats unless inspection or other indication shows that the fiber reinforcement has broken. Where inspections indicate failure of fiber reinforcement, proceed as for a large crack repair, but only for length of crack with broken fiber reinforcement.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the topcoat plaster, widen the crack and sand surface of the exposed basecoat to remove these deposits.
- E. Wet substrate to damp condition, but without visible water droplets.
- F. Force finish-coat plaster without aggregate into crack, filling crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

3.8 LARGE CRACK REPAIR

- A. General: Repair cracks over 1/32 inch in width in otherwise sound plaster.
 - 1. Notify Architect of undocumented detrimental conditions including cracks, bulges, loose backup, rotted wood, rusted metal, and other deteriorated items.
 - 2. Maintain adjacent plasterwork in an undamaged condition so far as practicable.
- B. Open crack to at least 1/8 inch in width and full depth with V-groove tool, and check for bond separation or lath deterioration.
- C. Abrade side surfaces of crack and remove inner crack debris by gouging (keying) the inside area of the crack.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material. Where grease, waxes, oils, waterborne staining, or other foreign matter and deposits that could impair bond with repair material have penetrated into the plaster, widen the crack to remove these deposits.
- E. Wet substrate to damp condition, but without visible water droplets.
- F. Install finish-coat plaster to fill crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.
- H. Offset Cracks: If the crack is offset in surface plane by more than 1/8 inch, dismantle the plaster on each side of the crack, a minimum width of 6 inches and down to the lath or other substrate. Then, repair as specified for flat-plaster removal and replacement.

3.9 INSTALLATION TOLERANCES

- A. Completed plaster installation shall not deviate from a true plane by more than 1/8 inch as measured by a 5-foot straightedge placed at any location on a surface, except where existing plaster is retained as a substrate for new plasterwork.

3.10 CLEANING AND PROTECTION

- A. Protect work of other trades against damage. Promptly remove plaster from surfaces not indicated to be repaired or plastered. Do not scratch or damage finished surfaces.
- B. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.
- C. Correct damage to other historic surfaces and to new work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. Remove temporary protection and enclosure of other work.

END OF SECTION 09 03 20

SECTION 09 03 91 - HISTORIC TREATMENT OF PLAIN PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of plain painting as follows:
 - 1. Removing existing paint.
 - 2. Repairing substrates.
 - 3. Plain painting of historic surfaces, including varnishing of historic wood.
- B. Related Requirements:
 - 1. Section 01 35 91 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 09 91 23 "Interior Painting" for painting modern surfaces.

1.3 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of painting.
 - 2. Review methods and procedures related to historic treatment of painting including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application and sequencing.

1.5 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of painting in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 - 4. Apply paint system.
 - 5. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist(s).
- B. Plain Painting Historic Treatment Program: Submit before work begins.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic painting specialist with expertise in matching and touching up existing painting. Experience only in new painting work is insufficient experience for historic treatment work.
- B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing paint removers that have been used for similar historic painting applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Mockups: Prepare mockups of historic treatment processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
 - 1. Locate mockups on existing surfaces where directed by Architect.
 - 2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least 100 sq. ft.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing of cleaning materials, paint removers for each indicated type of painted surface.
 - 1. Use test areas as indicated and representative of proposed materials and existing construction.
 - 2. Propose changes to materials and methods to suit Project.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste daily.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for every 5 gal. of solution required.

2.2 PAINT REMOVERS

- A. Solvent-Type Paste Paint Remover: Manufacturer's standard, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project.
 - 1. Basis of Design: Dad's Easy Spray, Professional Strength
- B. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinsable, solvent-type paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.
 - 1. Basis of Design: ProS0Co Safety Peel 1

2.3 PATCHING MATERIALS

- A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT SPECIALIST

- A. Historic Treatment Specialist Firms: Subject to compliance with requirements, firms that may provide historic treatment of plain painting include, but are not limited to, the following:
 - 1. Specialized Property Services.

3.2 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Neutralize and collect alkaline and acid wastes before disposal.

3.3 HISTORIC TREATMENT OF PAINTING, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building interior at 5 feet away from painted surface and from building exterior at 20 feet away from painted surface.
- B. Execution of the Work: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Remove coatings from historic wood and glass surfaces and repaint.
 - 2. Verify that substrate surface conditions are suitable for painting.
 - 3. Allow other trades to repair items in place and retain as much original material as possible before repainting.
 - 4. Install temporary protective measures to protect historic painted surfaces that shall be treated later.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail. Do not use abrasive methods such as rotary sanding, rotary wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Abrasive Blasting: Where abrasive blasting is scheduled, use pulverized walnut shells at the lowest pressure required to remove existing paint.
 - 1. If preconstruction testing proves that pulverized walnut shells will not remove the existing, other more abrasive blast media will be tested.
- E. Heat Processes: Do not use torches, heat guns, or heat plates.

3.4 EXAMINATION

- A. Examine substrates and conditions, with historic treatment specialist present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.

- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:
 - 1. Wood: 15 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 - 1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.5 PREPARATORY CLEANING

- A. General: Use only the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.
- C. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.

3.6 PAINT REMOVAL

- A. General: Remove paint where indicated. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.
 - 1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
 - a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
 - b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.
 - 2. Brushes: Use brushes that are resistant to chemicals being used.
 - a. Wood Substrates: Do not use wire brushes.
 - 3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
 - c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
- B. Paint Removal with Hand Tools: Remove paint manually using hand-held scrapers, wire brushes, sandpaper, and metallic wool as appropriate for the substrate material. Do not use other methods except as indicated as part of the historic treatment program and as approved by Architect.

- C. Paint Removal with Solvent-Type Paste Paint Remover:
 - 1. Remove loose and peeling paint using scrapers, stiff brushes, or a combination of these.
 - 2. Apply thick coating of paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paintbrush. Apply in one or two coats according to manufacturer's written instructions.
 - 3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 - 4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
 - 5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
 - 6. Repeat process if necessary to remove all paint.
- D. Paint Removal with Covered, Solvent-Type Paste Paint Remover:
 - 1. Remove loose and peeling paint using scrapers, stiff brushes, or a combination of these.
 - 2. Apply paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paint brush or as recommended in writing by manufacturer.
 - 3. Apply cover according to manufacturer's written instructions.
 - 4. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 - 5. Scrape off paint and remover.
 - 6. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
 - 7. Use mechanical methods recommended in writing by manufacturer to remove remaining chemicals and paint residue.

3.7 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
 - 1. It is not the intent for every defect or blemish to be repaired or removed so that a building looks inappropriately new for its age.
- B. Wood Substrate:
 - 1. Repair wood defects including dents and gouges more than 1/4 inch in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.
- B. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection and provide on-site assistance when requested by Architect.
- C. Paint Material Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for composition and dry film thickness.
 - 1. Paint Composition: The following procedure may be performed at any time and as often as Owner deems necessary during the period when paints are being applied:
 - a. Testing agency will sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - b. Testing agency will perform tests for compliance of paint materials with product requirements.
 - c. If test results show materials being used do not comply with product requirements, remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

2. Dry Film Thickness:
 - a. Touch up and restore painted surfaces damaged by testing.
 - b. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.9 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.10 SURFACE-PREPARATION SCHEDULE

- A. General: Before painting, prepare historic wood surfaces for painting according to applicable requirements specified in this schedule.
 1. Examine surfaces to evaluate each surface condition according to paragraphs below.
 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
 3. Repair substrate defects according to "Substrate Repair" Article.
- B. Surface Preparation for Wood:
 1. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool or chemical paint-removal methods.
 2. Paint Removal: Completely remove paint film by chemical paint-removal methods.
 3. Preparation for Painting: Prepare bare cleaned surface according to paint manufacturer's written instructions for substrate construction materials.

3.11 INTERIOR HISTORIC PAINTING SCHEDULE

- A. Wood Frames and Moldings:
 1. Alkyd Varnish System (Clear):
 - a. First Coat: Interior varnish matching topcoat.
 - b. Topcoat: Varnish, interior, semigloss.
 - 1) Basis of Design: S-W Wood Classics Polyurethane Varnish

END OF SECTION 09 03 91

SECTION 09 21 16 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.
- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: As indicated.
- B. STC Rating: As indicated.
- C. Gypsum Shaftliner Board:
 - 1. Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
 - 2. Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D 3273 mold-resistance score of 10 as rated according to ASTM D 3274, 1 inch thick, and with double beveled long edges.

- D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C 645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.
 - 1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.
- E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
 - 1. Depth: 2-1/2 inches.
 - 2. Minimum Base-Metal Thickness: 0.033 inch.
- F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
 - 1. Minimum Base-Metal Thickness: 0.033 inch.
- G. Finish Panels: Gypsum board as specified in Section 09 29 00 "Gypsum Board."

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
- E. Reinforcing: Galvanized-steel reinforcing strips with 0.033-inch minimum thickness of base metal (uncoated).
- F. Acoustical Sealant: Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
 - 3. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking in metal framed partition for the support of partition accessories and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: For embossed steel studs and tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Metal Thickness: 0.0269 inch.
 - b. Depth: 3-5/8 inches, unless otherwise indicated.
 - 2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.
 - a. Minimum Base-Metal Thickness: 0.0190 inch.
 - b. Depth: 3-5/8 inches, unless otherwise indicated.
- C. Slip-Type Head Joints: Where indicated, provide the following:

1. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0269 inch.
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.0296 inch.
 2. Depth: 7/8 inch.

2.2 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.
- B. Hanger Attachments to Concrete:
1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58 or AC308 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Type: Torque-controlled, expansion anchor or adhesive anchor.
 - c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch wide flanges.
1. Depth: 1-1/2 inches.
- F. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges, 3/4 inch deep.
 2. Steel Studs and Tracks: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0269 inch.
 - b. Depth: 2-1/2 inches, unless otherwise indicated.
 3. Embossed Steel Studs and Tracks: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0190 inch.
 - b. Depth: 3-5/8 inches, unless otherwise indicated.
 4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.0296.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary wood framing, and wood blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Refer to Section 06 10 53 "Miscellaneous Rough Carpentry."
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
 - 2. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

3.5

- A. Install studs so flanges within framing system point in same direction.
- B. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

3.6

1. Where partitions are indicated to terminate above suspended ceilings provide supplemental bracing from the top track to structural members at 48 inches on center, minimum. Bracing size shall match the partition framing.
 2. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 3. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
- B. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- C. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.7 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
 2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 24 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior vertical plasterwork (stucco).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for each substrate and finish texture indicated for cement plastering, including accessories.
 - a. Size: 100 sq. ft. in surface area.
 - 2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover, and keep them dry and protected against damage from weather, moisture, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.6 FIELD CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Exterior Plasterwork:
 - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 - 2. Apply plaster when ambient temperature is greater than 40 deg F.
 - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. General: Comply with ASTM C 1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Plastic Accessories: Manufactured from high-impact PVC.

1. Cornerbeads: With perforated flanges.
 - a. Smallnose cornerbead; use unless otherwise indicated.
2. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.
 - a. Square-edge style; use unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C 932.

2.3 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I.
 1. Color for Finish Coats: Gray.
- B. Masonry Cement: ASTM C 91, Type N.
 1. Color for Finish Coats: Gray.
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.

2.4 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
- B. Base-Coat Mixes for Use over Unit Masonry and Concrete: Single base (scratch) coat for two-coat plasterwork on high-absorption plaster bases as follows:
 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 3. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
- C. Job-Mixed Finish-Coat Mixes:
 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
 2. Masonry Cement Mix: Use 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 3. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare smooth, solid substrates for plaster according to ASTM C 926.

3.3 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
 - 1. At exterior locations use Plastic Components.
- B. Reinforcement for External (Outside) Corners:
 - 1. Install cornerbead at exterior locations.

3.4 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces when measured by a 10-foot straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- B. Plaster Thickness:
 - 1. Two-coat Work:
 - a. Unit Masonry and Concrete:
 - 1) Vertical Applications: 5/8 inch.
 - 2) Horizontal Applications: 3/8 inch.
- C. Bonding Compound: Apply on unit masonry and concrete substrates for direct application of plaster.
- D. Walls; Base-Coat Mix: For base (scratch) coat, for two-coat plasterwork and having 3/8-inch thickness on masonry and concrete, one of the following:
 - 1. Portland cement mix.
 - 2. Masonry cement mix.
 - 3. Portland and masonry cement mix.
- E. Plaster Finish Coats: Apply to provide textured finish to match the existing walls..

3.5 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work after plastering is complete. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Requirements:
 - 1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- B. Gypsum Wallboard: Type C: ASTM C1396/C1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. Core: 5/8 inch, Type X.
 - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, or plastic.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

- D. Joint Compound for Tile Backing Panels:
 - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- E. Acoustical Sealant: As specified in Section 07 92 19 " Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- C. Locate edge and end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- D. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor / roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- E. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- F. Assemblies Sound Attenuation Blankets: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- G. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Where required for fire-resistance-rated assembly and Vertical surfaces unless otherwise indicated.
 - 2. Type C: At shaft wall assemblies.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Glass-Mat, Water-Resistant Backing Board: At locations indicated to receive tile.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 4. Level 5: Where indicated.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Glazed wall tile.
 - 3. Waterproof membrane for thinset applications.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for selection of tile.
 - 2. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 3. Section 09 29 00 "Gypsum Board" for glass-mat, water-resistant backer board.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Face Size: Actual tile size, excluding spacer lugs.
- D. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Product Test Reports: For tile-setting and -grouting products.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 - 3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of wall tile installation.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- B. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.2 TILE PRODUCTS

- A. Ceramic Tile.
 - 1. Product: As selected by Architect from Allowance options
 - 2. Face Size: Maximum 8 by 8 inches.
 - 3. Grout Color: As selected by Architect from manufacturer's full range.
 - 4. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Outside Corners: Field-buttet bullnose edge on one tile.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
- C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
- D. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.

2.4 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
 - 1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.5 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

2.6 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

2.7 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. Where adjoining tiles on base, walls or trim are specified or indicated to be same size, align joints.
 - 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Tile: 1/4 inch.
 - 2. Glazed Wall Tile: 1/8 inch.

3.4 INSTALLATION OF WATERPROOF MEMBRANE

- A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Metal Studs or Furring:
 - 1. Ceramic Tile Installation: TCNA W245; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Ceramic Tile Type: Glazed porcelain tile.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance grout.
- B. Shower Wall Installations, Metal Studs or Furring:
 - 1. Ceramic Tile Installation: TCNA B419; thinset mortar on coated glass-mat, water-resistant gypsum backer board
 - a. Ceramic Tile Type: As selected by the Architect.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: High-performance grout.

END OF SECTION 09 30 13

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS (APC-1)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Rockfon (Roxul Inc.); Rockfon Tropic.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 1. Type and Form: Type XX, high-density, mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
 2. Pattern: G (smooth).
- D. Color: White
- E. Light Reflectance (LR): Not less than 0.85.
- F. Ceiling Attenuation Class (CAC): Not less than 22.
- G. Noise Reduction Coefficient (NRC): Not less than 0.90.
- H. Articulation Class (AC): Not less than 180.
- I. Edge/Joint Detail: Reveal.
- J. Thickness: 3/4 inch.
- K. Modular Size: 24 by 24 inches.

2.4 ACOUSTICAL PANELS (APC-2)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Tectum Ceiling Panels.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and as follows:
 1. Type and Form: Type XIV, high-density, wood fibers bonded with inorganic hydraulic cement, resistant to heat, moisture, and corrosive fumes.
 2. Pattern: F (heavy texture).
- C. Color: White.
- D. Edge/Joint Detail: Square.
- E. Thickness: 1 inch.
- F. Modular Size: As indicated on the Drawings.
- G. Flame Spread: ASTM E 1264; Class A.
- H. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.
- I. Attachment: Direct, to metal framing (furring).
 1. #6 x 1-5/8" Drill Point Screws, with heads painted to match panel color.

2.5 METAL SUSPENSION SYSTEM

- A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
 1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635/C 635M.

- B. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G60 coating designation; with prefinished, 15/16-inch-wide aluminum caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. Face Design: Flat, flush.
 - 3. Cap Finish: Painted white.

2.6 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

2.7 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

2.8 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 7. Attach hangers to structural members.
 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage. END of 09 51 13

SECTION 09 54 26 - SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood-veneer, linear-plank ceilings.
- B. Related Requirements:
 - 1. Section 08 14 16 "Flush Wood Doors " for wood species and finish.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.

1.4 COORDINATION

- A. Coordinate layout and installation of wood ceilings and suspension systems with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For suspended wood ceilings.
 - 1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:
 - a. Wood ceiling patterns and joints.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - e. Ceiling perimeter and penetrations through ceiling; trim and moldings.
- C. Samples: For each exposed product and for each type, color, and finish specified, 12 inches long by 12 inches wide or full width in size.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - 1. Store materials flat and level, raised from the floor.
- B. Handle ceiling components and accessories in a manner that prevents damage.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install interior ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
1. Store and acclimatize wood products in the spaces where they will be installed for a minimum of 72 hours immediately before ceiling installation.

PART 2 - PRODUCTS

2.1 WOOD-VENEER, LINEAR-PLANK CEILING

- A. Linear Ceiling Planks: Manufacturer's standard planks consisting of wood veneer adhered to backs and exposed surfaces of manufacturer's standard composite-wood cores; with square-cut ends.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc / Woodworks Linear. Veneered Planks, or comparable product by one of the following:
 - a. CertainTeed / Linear Planks.
 - b. Rulon International / Linear Open Style.
 - c. USG Corporation / True® Wood Linear Planks.
 2. Surface-Burning Characteristics: Provide products with the following characteristics when tested in accordance with ASTM E84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 3. Veneer Face Grade: Manufacturer's standard.
 4. Veneer Species: Match wood species (Select white birch or Select white maple or Red oak or White oak).
 5. Veneer Cut: Plain sliced (flat cut).
 6. Nominal Plank Width: 4 inches.
 7. Plank Depth: 5/8 inch.
 8. Plank Length: 96 inches.
 9. Plank Long Edge: Square.
 - a. Reveal/Plank Spacing: 3/4 inch between long edges of planks.
 - b. Reveal Filler Strip: Black felt.
 10. Plank End Joints: Butt.
 11. Factory Finish: Manufacturer's standard finish; applied on every wood surface.
 - a. Stain: Match wood door stain color and finish.
 - b. Gloss: Semigloss.
- B. Linear-Ceiling-Plank Accessories: Linear-ceiling-plank manufacturer's accessories required to provide a complete installation of ceiling in accordance with manufacturer's written installation instructions.
1. Attachment Clips: Manufacturer's standard metal clips for attaching planks to suspension system.
 2. Plank Leveling Splines: Manufacturer's standard for aligning ends of planks.
 3. Plank Splice Plates: Manufacturer's standard.
 4. Veneer Edge Banding: Manufacturer's standard matching planks for treating cut edges; with pressure-sensitive adhesive backing.

5. Trim: As indicated on the Drawings; with trim connectors recommended in writing by ceiling and suspension-system manufacturers.
 - a. Material: Wood-veneered composite wood, finished to match planks or solid wood finished to match planks.

C. Grid Suspension System: ASTM C635/C635M; recommended in writing by ceiling and suspension-system manufacturers for applications indicated; main- and cross-runner system complete with suspension-system components required to support ceiling units and other ceiling-supported construction.

1. Material: ASTM A653/A653M, hot-dip galvanized, cold-rolled sheet steel, G60 coating designation.
2. Structural Classification: Heavy-duty system.
3. Face Width: 15/16 inch.
4. Finish: Flat black.

2.2 SUSPENSION-SYSTEM HANGERS, BRACES, AND TIES

- A. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
- B. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung is less than yield stress of wire, but provide not less than 0.135-inch diameter wire.
- C. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed from 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of suspended wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of suspended wood ceilings.
 1. Balance border widths at opposite edges of each ceiling.
 2. Avoid using less-than-half-width units.

3.3 INSTALLATION

- A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 3 inches. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that does not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 7. Attach hangers to structural members.
 8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim at perimeter of ceiling area and where necessary to conceal edges and ends of wood units.
1. Do not use exposed fasteners on moldings and trim.
- D. Grid Suspension Systems: Space main beams at 48 inches o.c.
1. Install cross tees to form modules sized in accordance with manufacturer's written installation instructions.
 2. Remove and replace dented, bent, or kinked members.
- E. Install wood components and accessories in accordance with manufacturer's written instructions and to accommodate natural expansion and contraction of wood products resulting from fluctuations in humidity.
- F. Cut wood components for accurate fit at borders and at interruptions and penetrations by other work through ceilings.
1. Stiffen edges of cut wood components as required to eliminate variations in flatness.
- G. Treat field-cut edges of wood components in accordance with manufacturer's written recommendations; finish exposed field cuts to match factory finish.
1. Wood-Veneer Units: Edge band exposed field-cut edges.
- H. Install wood components in coordination with suspension system and moldings and trim.
1. Install wood components in patterns indicated on Drawings.
- 3.4 CLEANING
- A. Clean exposed surfaces of ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented units.

END OF SECTION 09 54 26

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl base.
 - 2. Vinyl molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL BASE

- A. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
 - 1. Group: I (solid, homogeneous).

- 2. Style: B, Cove.
- B. Minimum Thickness: 0.125 inch.
- C. Height: 4 inches.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed or preformed.
- F. Inside Corners: Job formed or preformed.
- G. Colors: As selected from the by manufacturer's colors.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50] g/L or less.

2.3 VINYL MOLDING ACCESSORY

- A. Description: Vinyl nosing for carpet and joiner for tile and carpet.
- B. Locations: Provide vinyl molding accessories in locations indicated on the Drawings.
- C. Colors: As selected from the by manufacturer's colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths without seams on any wall and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Form with returns not less than 3 inches or more than 6 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Miter or cope at corners.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 13

SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes resinous flooring systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on minimum 96-inchesquare floor area in Room 121.
 - a. Include 96-inch length of integral cove base with inside corner.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product for: Subject to compliance with requirements, provide Stonhard, Inc.; Stonblend GSI-G (**RS-1**) and GSI (**RS-2**) or comparable products by one of the following:
 - 1. BASF Corporation;
 - 2. Crossfield Products Corp.; Dex-O-Tex.
 - 3. Key Resin Company.
 - 4. NEOGARD; Division of JONES-BLAIR.

2.2 DECORATIVE RESINOUS FLOORING

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.
- B. System Characteristics:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range, including premium.
 - 2. Wearing Surface: Smooth
 - 3. Overall System Thickness: 3/16 inch.
- C. Primer:
 - 1. Basis of Design: Stonblend Primer
 - 2. Resin: Epoxy
 - 3. Formulation Description: 2 component, 100% solids
 - 4. Number of Coats: one
- D. Mortar Base:
 - 1. Basis of Design: Stonblend Mortar
 - 2. Resin: Epoxy.
 - 3. Formulation Description: 3 component, 100% solids
 - 4. Application Method: Troweled
 - a. Thickness of Coats: 3/16"
 - b. Number of Coats: one.
 - 5. Aggregates: Pigmented quartz blended aggregate
 - a. **RS-1** only: include 12% colored glass

- E. Grout Coat:
 - 1. Basis of Design: Stonblend Grout Coating
 - 2. Resin: Epoxy
 - 3. Formulation Description: 2 component, 100% solids
 - 4. Application Method: Roller
 - 5. Number of coats: 1
- F. Sealer:
 - 1. Basis of Design: Stonshield Sealer
 - 2. Resin Epoxy
 - 3. Formulation Description: 100% solids
 - 4. Application Method: Roller
 - 5. Number of coats: one
- G. Top Coat
 - 1. Basis of Design: Stonseal GS7
 - 2. Resin: Urethane.
 - 3. Formulation Description: 2 component, 100% solids
 - 4. Type: Clear
 - 5. Finish: Matte
 - 6. Number of Coats: two
- H. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
 - 1. Compressive Strength: 6,000 psi after 7 days per ASTM C 579.
 - 2. Tensile Strength: 1,500 psi per ASTM C 307.
 - 3. Flexural Strength: 2,200 psi per ASTM C 580.
 - 4. Water Absorption: < 1% per ASTM C 413.
 - 5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
 - 6. Flammability: Self-extinguishing per ASTM D 635.
 - 7. Critical Radiant Flux: 0.45 W/sq. cm or greater per NFPA 253.
 - 8. Hardness: 85 to 90, Shore D per ASTM D 2240.

2.3 ACCESSORIES

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 - 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

- a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
 - C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
 - D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- 3.2 INSTALLATION, GENERAL
- A. Extend resinous flooring into recesses and under or behind equipment, cabinets, casework and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- 3.3 APPLICATION
- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
 - B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
 - C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 1. Integral Cove Base: 4 inches high.
 - D. Apply troweled body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.
 - E. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
 - F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.
- 3.4 FIELD QUALITY CONTROL
- A. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer

END OF SECTION 09 67 23

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of installation.
 - 4. Pattern type, location, and direction.
 - 5. Pile direction.
 - 6. Type, color, and location of edge, transition, and other accessory strips.
 - 7. Transition details to other flooring materials.
- C. Samples for Initial Selection: For each type of carpet tile.
 - 1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Carpet Tile: Full-size units equal to 1 percent of amount installed for each type and color indicated, but not less than 10 sq. yd.
 - b. This stock shall be designated for use by the Owner only, after completion of the Project and shall not be used for repair or replacement during warranty period.
- B. Cleaning
 - 1. Provide tile carpeting manufacturer's printed instructions to designated USF S-M S-M personnel on the proper methods and procedures for cleaning the tile carpeting material furnished.
 - 2. A representative of the Tile Carpeting Manufacturer shall provide a demonstrate cleaning and stain removal processes to USF S-M maintenance personnel at:
 - a. 30 days prior to Substantial Completion;
 - b. 6 months from date of Substantial Completion
 - c. 11 months from date of Substantial Completion.

1.7 QUALITY ASSURANCE

- A. Manufacturer(s) Qualifications
 - 1. The specified materials shall be a current and regular production item.
 - 2. Manufacturer shall have a minimum of fifteen (15) years of production experience with carpet tiles of similar types and whose published product literature clearly indicates compliance of their product with a particular carpet tile specified.
 - 3. Manufacturer shall provide verification of registration to ISO 9001/9002 Quality Management System and ISO 14001 Environmental Management System.
 - 4. Manufacturer shall provide three (3) references of installations in similar facilities.
 - 5. Manufacturer must provide Chain of Responsibility that states they will take back their product for recycling at the end of its useful life.
- B. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
 - 1. Employ only experienced Contractors (Installers) skilled in the successful installation of the specified materials and accessories on similar projects for a minimum of five (5) years, acceptable to the carpet tile manufacturer in writing to Owner/USF S-M.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104 Section 5 Storage and Handling.
- B. Tile carpeting shall not be delivered or installed until building is enclosed, wet work completed and HVAC system is operating and maintaining temperature and humidity at occupancy level during remainder of construction period.

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. More than ten percent (10%) loss of face fiber/yarn loss by weight
 - a. Dimensional instability.
 - b. Excess static discharge.
 - c. Loss of tuft-bind strength.
 - d. Loss of face fiber.
 - e. Delamination.
 - 3. Warranty Period: 15 years from date of Substantial Completion.
 - 4. Warranty shall not require the use of chair pads.
 - 5. Manufacturer shall warranty that dye lots are mergeable.
 - 6. Warranty shall identify the following: Pattern name; pattern color; square yards used.
 - 7. In case of multiple buildings where tile carpeting has been used, identify building name/number and pattern, pattern color, square yards used.
- B. Installer's Warranty: The Tile Carpeting Contractor (Installer) shall fully guarantee the installation against defects in workmanship, seaming and loss of adhesion to floor for a period of one (1) year from the date of Substantial Completion. Upon written notice, the Installer shall repair or replace the affected area at no cost to USF S-M.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Interface, LLC.
 - 2. J&J Invision; J&J Industries, Inc.
 - 3. Milliken & Company.
 - 4. Mohawk Group (The); Mohawk Carpet, LLC.
 - 5. Shaw Contract Group; a Berkshire Hathaway company.
 - 6. Tandus; a Tarkett company.
- B. Color / Pattern: As selected by Architect from manufacturer's full ranges.
 - 1. Number of colors / patterns for bidding purposes unless otherwise shown on Drawings:
 - a. Colors / Patterns: Limited to 6
 - b. Colors / Pattern per room or space: Limited to 3
- C. Fiber Content: 100 percent nylon Type 6 or 6,6 with Modification Ratio of less than 2.5.
- D. Fiber Type: Branded type, Aquafil Struttura, Invista, Solutia.
- E. Dye Method: Minimum of 65% Solution dyed.

- F. Mergeability: Tile carpeting that is of the same style/color, but from different dye lots and/or manufacturing dates, may be merged and used interchangeably, both at initial installation and at later selective replacement, to create a continuous carpeted surface with no tile appearing out of place.
- G. Pile Characteristic: Level-loop pile.
- H. Density: 5400 minimum.
- I. Stitches: 8.00 stitches per inch.
- J. Gage: 1/12" minimum.
- K. Surface Pile Weight: 17 oz./sq. yd., minimum.
- L. Primary Backing/Backcoating: Manufacturer's standard vinyl or thermoplastic hard-backed backing system, 39% minimum total recycled content, maintaining a 100% true moisture barrier between secondary backing and the floor substrate below, passing the British Spill Test, Method E.
- M. Size: 18 by 18 inches to 40 by 40 inches, square.
- N. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Must have low water solubility and not be metallic or halogen based.
 - b. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1- mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174, Part II, AATCC 138 Washed; AATCC 174 Parts 2 & 3. (If requested, provide USF S-M with independent test certification(s) that states use of antimicrobial treatment is in compliance with all governmental regulations, including the AATCC specifications stated in this paragraph, regarding its use within the complete carpet tile construction/assembly.
 - c. Antimicrobial preservative shall be incorporated into primary backing of the product during manufacturing and not topically applied to the fiber.
- O. Performance Characteristics:
 - 1. Appearance Retention Rating: Moderate traffic, 2.5 minimum according to ASTM D 7330.
 - 2. Stain Resistance: AATCC-175, must pass Acid Red 40 spot test with an 8 or better.
 - 3. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - 4. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
 - 5. Tuft Bind: Not less than 6.2 lbf according to ASTM D 1335.
 - 6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
 - 7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
 - 8. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
 - 9. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
 - 10. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134 at 20% relative humidity.
 - 11. Smoke Density: < or = 450 flaming.
 - 12. Flame-Spread and Flammability: Carpet flammability shall meet federal Flammability Standards CPSC FF 1-70, when tested in accordance with ASTM D2959-70T (Methenamine Pill Test).

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

- B. Installation Method: Free lay; install carpet tiles without adhesive.
 - 1. Provide plastic squares at each corner of each tile to interconnect the carpet tiles.
 - a. Basis of Design: InterfaceFLOR, LLV, TacTiles Connectors.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates including, but not limited to, the following exterior substrates:
 - 1. Clay masonry.
 - 2. Concrete masonry units (CMUs).
 - 3. Steel and iron.
 - 4. Galvanized metal.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 05 51 16 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 4. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams Company (The) products listed in the Interior Painting Schedule below or comparable product by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Coatings.
 - 3. Pratt & Lambert.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): 12 percent.
 - 2. Portland Cement Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 3.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

4. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. CMU Substrates:
 1. Latex System:
 - a. Block Filler: Block filler, latex, interior/exterior:
 - 1) S-W PrepRite Block Filler, B25W25, at 75 to 125 sq. ft. per gal.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen.
 - 1) S-W A-100 Exterior Latex Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

B. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, water based.
 - 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss.
 - 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.

C. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, water based.
 - 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss.
 - 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.

D. Portland Cement Plaster Substrates:

1. Latex System:

- a. Prime Coat: Primer sealer, latex.
 - 1) S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
 - 1) Not required at existing painted surfaces.
- c. Topcoat: Latex, exterior, sheen to match existing.
 - 1) S-W A-100 Exterior Latex, at 4.0 mils wet, 1.2 mils dry, per coat.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates including, but not limited to, the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel and iron.
 - 4. Galvanized metal.
 - 5. Gypsum board.
 - 6. Plaster.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing" for shop priming structural steel.
 - 2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
 - 3. Section 05 51 16 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
 - 4. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.
 - 5. Section 09 03 91 - Historic Treatment of Plain Painting for painting historic concrete, wood surfaces and removing paint from historic concrete.
- C. Paint exposed surfaces whether or not indicated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Lead Paint: It is not expected that lead paint will be encountered in the Work.
 1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams Company (The) products listed in the Interior Painting Schedule below or comparable product by one of the following:
 1. Benjamin Moore & Co.
 2. PPG Architectural Coatings.
 3. Pratt & Lambert.
- B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 016000 "Product Requirements," and the following:
 1. Products are approved by manufacturer in writing for application specified.
 2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.
- C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors:

1. Architect shall select paint/coating material colors and shades from manufacturer's full range and provide a schedule of colors and finishes. This Contractor may use other products specifically listed in the pertinent-paragraphs but shall submit matching chips or matching color samples to the Architect's satisfaction.
2. Provide a 7" X 12" actual brush-out or drawn-down on a suitable surface, for each color and product. The approved samples shall be placed on file in the Contractor's field office.
3. The paint manufacturer shall first provide one (1) quart of each color and of each product. The painting/coating subcontractor shall paint a 25 s.f. sample on the job of each color and product.

C. Color Information for Estimating:

1. Number of colors (of pigmented coating) for bidding purposes unless otherwise shown on Drawings:
 - a. Colors for interior: Limited to 4
 - b. Colors per room or space: Limited to 2
2. Color strength for-estimating unless otherwise shown on Drawings:
 - a. Light to medium paint hues: 80% of areas
 - b. Strong dark paint hues: 20% of areas
3. Approval of the in-place color against approved color chips shall be solely the right and judgment of the Architect.
4. Each coat of paint/coating shall be tinted slightly lighter than next coat or finish coat in order to establish actual application of each coat did occur. The degree of tint difference shall be as determined by the Architect.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
 2. Masonry (Clay and CMUs): 12 percent.
 3. Gypsum Board: 12 percent.
 4. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" or "MPI Maintenance Repainting Manual" as applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. SSPC-SP 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Traffic Surfaces:
 1. Surface Preparation:
 - a. Clean surfaces to remove dirt and miscellaneous contamination.
 - b. Remove loose mortar and patch.
 2. Water-Based Concrete Floor Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, matching topcoat.

- 1) S-W H&C Clarishield Water-Based Wet-Look Concrete Sealer, at 100 to 200 sq. ft. per gal.
 - b. Second Coat:
 - 1) S-W H&C Clarishield Water-Based Wet-Look Concrete Sealer, at 100 to 200 sq. ft. per gal.
- B. CMU Substrates:
1. Latex Finish System:
 - a. Block Filler: One or two coats as required: Block filler, latex, interior/exterior:
 - 1) S-W Loxon Block Surfacer, A24W200, at 10.0 mils wet, 8.0 mils dry, per coat.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, eggshell:
 - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
- C. Steel Substrates:
1. Latex System:
 - a. Prime Coat: Primer, rust-inhibitive, water based:
 - 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils wet, 2.0 to 4.0 mils dry.
 - b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
 - c. Topcoat: Water-based acrylic, semi-gloss:
 - 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.
- D. Galvanized-Metal Substrates:
1. Latex System:
 - a. Prime Coat: Primer, rust-inhibitive, water based:
 - 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils wet, 2.0 to 4.0 mils dry.
 - b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
 - c. Topcoat: Water-based acrylic, semi-gloss:
 - 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.
- E. Gypsum Board and Plaster Substrates:
1. Latex System:
 - a. Prime Coat: Primer, latex, interior:
 - 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils wet, 1.0 mils dry.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, eggshell:
 - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils wet, 1.7 mils dry, per coat.
 2. Epoxy-Modified Latex System:
 - a. Prime Coat: Primer sealer, latex, interior.
 - 1) S-W ProMar 200 Interior Latex Primer.
 - b. Intermediate Coat: Epoxy-modified latex, matching topcoat.
 - c. Topcoat: Epoxy-modified latex, semi-gloss.
 - 1) S-W Pro Industrial Water Based Catalyzed Epoxy.

SECTION 10 21 13 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking.
 - 2. Section 10 28 00 "Toilet Room Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
 - 1. Include Samples of hardware and accessories involving material and color selection.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The Solid-Plastic Toilet Compartments and Plastic Vanities, specified in Section 12 36 23, shall be products of the same manufacturer.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Toilet-Enclosure Style: Overhead braced.
- B. Urinal-Screen Style: Wall hung.
- C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 2. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.
- D. Pilaster, Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.
1. Polymer Color and Pattern: Matching pilaster.
- E. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- F. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; polymer or stainless steel.
 - a. Polymer Color and Pattern: Matching panel.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
1. Material: Stainless steel.
 2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B 221.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- C. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

SECTION 10 28 00 – TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Warm-air dryers.
 - 3. Underlavatory guards.
 - 4. Custodial accessories.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking for toilet and bath accessories mounted on or in wood or metal framed partitions or walls.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Toilet Tissue (Roll) Dispenser (TA-1):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #74022.
 - 2. Description: Double-roll dispenser.
 - 3. Mounting: Recessed.
 - 4. Operation: Noncontrol delivery with standard spindle.
 - 5. Capacity: Designed for 6-inch diameter tissue rolls.
 - 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- C. Paper Towel (Folded) Dispenser (TA-2):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0210.
 - 2. Mounting: Surface mounted.
 - 3. Minimum Capacity: 400 C-fold or 525 multifold towels.
 - 4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - 5. Refill Indicator: Pierced slots at sides or front.
- D. Liquid-Soap Dispenser (TA-3):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0347.
 - 2. Description: Designed for dispensing soap in liquid or lotion form.
 - 3. Mounting: Vertically oriented, surface mounted.
 - 4. Capacity: 40 oz.
 - 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - 6. Refill Indicator: Window type.
- E. Liquid-Soap Dispenser (TA-4):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0332.
 - 1. Description: Designed for dispensing soap in liquid or lotion form.
 - 2. Mounting: Deck mounted on vanity.
 - 3. Capacity: 34 oz.
 - 4. Materials:
 - a. Dispenser stem and spout shall be stainless steel with rubber “duck bill” check valves and an O-ring seal.
 - b. Valve body, internal parts, basin nut, threaded shank and globe adapter shall be molded plastic.
 - c. Spring, escutcheon washer, stem retainer collar and screw shall be stainless steel.
 - d. Escutcheon shall be chrome plated brass.
 - e. Soap container shall be translucent, polyethylene.
- F. Grab Bar (TA-5):
 - 1. Basis-of-Design Product: American Specialties, Inc., 3500-Series.
 - 2. Mounting: Flanges with exposed fasteners.
 - 3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 4. Outside Diameter: 1-1/2 inches.
 - 5. Configuration and Length: As indicated on Drawings.

- G. Sanitary-Napkin Disposal Unit (TA-6):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0472.
 - 2. Mounting: Partition mounted, dual access.
 - 3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel.
 - 4. Receptacle: Removable.
 - 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - H. Sanitary-Napkin Disposal Unit (TA-7):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0473.
 - 2. Mounting: Surface mounted.
 - 3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel.
 - 4. Receptacle: Removable.
 - 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - I. Mirror Unit (TA-8)
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #0620.
 - 2. Frame: Stainless steel channel.
 - a. Corners: Manufacturer's standard.
 - 3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below:
 - a. One-piece, galvanized-steel, wall-hanger device with locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 4. Size: As indicated on Drawings.
 - J. Robe Hook (TA-9):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #73081.
 - 2. Description: Single-prong unit.
 - 3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) or No. 7 finish (polished).
 - K. Shower Rod & Shower Room Accessories (TA-13)
 - 1. Basis-of-Design Product: American Specialties, Inc. Model #1204-2
 - 2. Description: 1 1/4" diameter stainless steel rod
 - 3. Length: As indicated on Drawings
 - 4. Include:
 - a. Vinyl Curtain (1200-V)
 - b. Stainless Steel Hooks (#1200-SHU)
 - c. Soap Basket #7322
 - d. Full-length mirror (#0620-2460)
- 2.3 WARM-AIR DRYERS
- A. Source Limitations: Obtain warm-air dryers from single source from single manufacturer.
 - B. Warm-Air Dryer (TA-10):
 - 1. Basis-of-Design Product: Excel Dryer, Inc. "Xlerator XL-SB" with recess kit Part # 40502.
 - 2. Mounting: Semirecessed.
 - 3. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a. Operation Time: 10 to 20seconds.
 - 4. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - 5. Electrical Requirements: 120 V, 13 A, 1500 W, single phase.

2.4 UNDERLAVATORY GUARDS

- A. Basis of Design: Truebro “Lav Shield” by IPS Corporation.
- B. Underlavatory Guard (TA-11):
 - 1. Description: Heavy-duty enclosure that shields all under lavatory piping, electronic faucet components, mixing valves, and trap primers that prevents direct contact with and burns from piping.
 - 2. Material and Finish: Antimicrobial, molded plastic, white.
 - 3. Fasteners: Stainless steel screws with vandal-resistant heads.

2.5 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Mop and Broom Holder (TA-12):
 - 1. Basis-of-Design Product: American Specialties, Inc., Model #1315-3.
 - 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 - 3. Length: 30 inches.
 - 4. Hooks: Two, minimum.
 - 5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 - 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
 - b. Rod: Approximately 1/4-inch-diameter stainless steel.

2.6 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- D. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 16 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Aluminum sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- E. Cabinet Trim Material: Same material and finish as door.
- F. Door Material: Aluminum sheet.
- G. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting lever handle with cam-action latch.
 - 2. Provide concealed hinge permitting door to open 180 degrees.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: Red.
 - 4) Orientation: Horizontal.

J. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.
 - a. Finish: Clear anodic.

K. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.
 - a. Finish: Clear anodic.

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated below:
 - 1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory- finished appearance. Use only materials and procedures recommended or furnished by fire- protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
 - 1. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.
 - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Horizontal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: Top of fire extinguisher to be at 42 inches above finished floor.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 73 16 - CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes: Design, fabrication, and installation of aluminum canopy systems.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for canopies.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, mounting heights, and attachment details.
 - 2. Detail fabrication and assembly of canopies.
 - 3. Show locations for blocking, reinforcement, and supplementary structural support.
- C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Certification: Submit design calculations signed by a Registered Professional Engineer, licensed in Florida. Design calculations shall state that the canopy system design complies with the wind requirements of the Florida Building code and ASCE 7-95, the stability criteria of applicable building code, and all other governing criteria.
- C. Delegated-Design Submittal: For canopies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Welding certificates.
- E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For canopies, to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Canopy fabricator (manufacturer).

- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.8 WARRANTY

- A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of canopies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including framework.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Canopy Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Florida professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design the canopy systems including the connection to the building.

2.2 MANUFACTURER / PRODUCT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mapes Canopies; Lumishade Hanger Rod Supported or comparable product by one of the following:
 - 1. Dittmer Architectural Aluminum
 - 2. Peachtree Protective Covers.
 - 3. Perfection Architectural Systems, Inc.
 - 4. Somfy Systems, Inc.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by awning manufacturer for type of use and finish indicated and with not less than the strength and durability properties of alloy and temper required by structural loads.
 - 1. Aluminum Plate and Sheet: ASTM B 209.
 - 2. Aluminum Extrusions: ASTM B 221.
 - 3. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, standard weight (Schedule 40).
 - 4. Drawn Seamless Tubing: ASTM B 210.
- B. Hanger Assemblies: Provide extruded aluminum hanger rods in manufacturer's standard shapes and sized to meet the design loads.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners.
 - 2. Provide bronze fasteners for fastening bronze.
- B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, and, where indicated, flat washers; Alloy Group 1.

- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- E. Post-Installed Anchors: Chemical anchors.
 - 1. Material: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts.

2.5 MISCELLANEOUS MATERIALS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- B. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

- A. Frame Fabrication: Fabricate awning frames from aluminum. Preassemble in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - 1. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
 - 2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Fabricate slip-fit connections exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 3. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure canopies in place and to properly transfer loads.

2.7 FINISHES

- A. Factory Finishing: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.
 - 1. High performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - a. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - b. Color: Black

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install canopies at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.
 - 1. Erect canopy true to line, level, and plumb.
 - 2. Provide hairline miters and fitted joints.
- B. Slip fit frame connections accurately together to form hairline joints, and tighten to secure.
- C. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing canopies to structural support and for properly transferring load to in-place construction.
- D. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- E. Coordinate canopy installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 CLEANING AND PROTECTION

- A. Touch up factory-applied finishes to restore damaged or soiled areas.
- B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 10 73 16

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manually operated roller shades with single rollers.
- B. Related Requirements:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.
- D. Samples for Initial Selection: For each type and color of shadeband material.
 - 1. Include Samples of accessories involving color selection.
- E. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of shadeband material.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc; Classic Mecho/5 Standard System or a comparable product by one of the following:
 1. Draper Inc.
 2. Hunter Douglas Contract.
 3. Lutron Electronics Co., Inc.
 4. Springs Window Fashions; SWFcontract.
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Bead Chains: Stainless steel.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Clip, jamb mount.
 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb. or for shades as recommended by manufacturer, whichever criterion is more stringent.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: Right side of interior face of shade, unless otherwise indicated.
 2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
 3. Shadeband-to-Roller Attachment: Removable spline fitting into integral channel in tube.

- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
- G. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open.
 - 2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 - 1. Source: Roller-shade manufacturer.
 - 2. Type: PVC-coated polyester.
 - 3. Weave: Basketweave.
 - 4. Thickness: 32 mil.
 - 5. Weight: 16.8 oz./sq. yd.
 - 6. Roll Width: 126 inches.
 - 7. Orientation on Shadeband: Railroaded.
 - 8. Openness Factor: 5 percent.
 - 9. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 24 13

SECTION 12 36 23- PLASTIC VANITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid plastic vanities (countertops).

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's descriptive data.
- B. Shop Drawings: For vanities. Show materials, finishes, edge and backsplash profiles, methods of joining, dimensioned layout, elevations and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For plastic material vanities to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate vanities similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of vanities.
- C. Solid Plastic Panels: Maximum flame spread/smoke developed rating of 75/450, tested to ASTM E84.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of vanities by field measurements before vanity fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate vanities or backsplashes.

1.8 WARRANTIES

- A. Provide manufacturer's 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Contract Documents are based on products by Scranton Products. (www.scrantonproducts.com)
- B. The Vanities and Toilet Partitions, specified in Section 10 21 13, shall be products of the same manufacturer.

2.2 MATERIALS

- A. Solid Plastic Panels:
 - 1. High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
 - 2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
 - 3. Color: As selected by the Architect from manufacturer's full color range.
- B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

2.3 FABRICATION

- A. Fabricate vanities according to plastic material manufacturer's written instructions and to the AWI/AWMA/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Tops, Splashes, Skirts, and End and Center Supports: 1 inch thick with edges radiused to 1/4 inch.
- C. Vanity Size: 24 inches deep by length indicated on Drawings.
- D. Shoes: 3 inches high, one-piece molded HDPE.
- E. Attachment Brackets: 16 inches long, heavy duty extruded aluminum with bright dip anodized finish.
- F. Joints: Fabricate vanities without joints.
- G. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures **in shop** using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of vanity and projecting 3/16 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare vanities in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill vanities in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.4 INSTALLATION MATERIALS

- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- B. Adhesive: Product recommended by plastic material manufacturer.
 - 1. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Sealant for Vanities: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install vanities in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Attach vanities to supporting construction with anchors best suited to substrate conditions.
- C. Install vanities level to a tolerance of 1/8 inch in 8 feet, 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- D. Install backsplashes and end splashes by adhering to wall and vanities with adhesive. Mask areas of vanities and splashes adjacent to joints to prevent adhesive smears.
- E. Install aprons to backing and vanities with adhesive. Mask areas of vanities and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- F. Complete cutouts not finished in shop. Mask areas of vanities adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 23

SECTION 12 36 61 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops.
- B. Related Requirements:
 - 1. Section 06 41 16 "Plastic-Laminate-Faced Architectural Cabinets" for cabinet bodies.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, and edge profiles, and methods of joining.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. Basis of Design: E. I. du Pont de Nemours and Company; Zodiaq Quartz Surfaces.
 - 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Premium.
- B. Countertops: 2 cm thick, quartz agglomerate with front edge built up with same material.
- C. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- D. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
 - 1. Joint Type: Bonded, 1/32 inch or less in width.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

END OF SECTION 12 36 61

SECTION 14 24 00 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hydraulic passenger elevators.
- B. Related Requirements:
 - 1. Section 01 50 00 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 - 2. Section 04 20 00 "Unit Masonry" for anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 - 3. Section 05 50 00 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Hoist beams.
 - c. Structural-steel shapes for subsills.
 - d. Pit ladders.
 - 4. Section 09 65 19 "Resilient Tile Flooring" for finish flooring in elevator car.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
 - 2. Include large-scale layout of car-control station and standby-power operation control panel.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, 3-inch-square Samples of sheet materials and 4-inch lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway and pit as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturers/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsill; electrical service; and electrical outlets, lights, and switches in hoistway, pits, and machine rooms.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HYDRAULIC ELEVATOR MANUFACTURERS

- A. Basis of Design: ThyssenKrupp "endura MLR"
- B. Source Limitations: Obtain elevators from single manufacturer.
 1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
1. Type: Holeless, beside-the-car, telescoping, dual cylinder.
 2. Rated Load: 2100 lb.
 3. Rated Speed: 110 fpm.
 4. Operation System: Single automatic operation.
 5. Auxiliary Operations:
 - a. Battery-powered lowering.
 - b. Automatic operation of lights and ventilation fans.
 6. Car Enclosures:
 - a. Inside Width: Not less than 72 inches from side wall to side wall.
 - b. Inside Depth: Not less than 60 inches from back wall to front wall (return panels).
 - c. Inside Height: Not less than 94 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Textured stainless steel.
 - g. Reveals: Black.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - i. Door Sills: Aluminum.
 - j. Ceiling: Luminous ceiling.
 - k. Handrails: 1/2 by 4 inches rectangular satin stainless steel, No. 4 finish, at rear of car.
 - l. Floor prepared to receive resilient flooring specified in Section 09 65 19 "Resilient Tile Flooring".
 7. Hoistway Entrances:
 - a. Width: 36 inches.
 - b. Height: 84 inches.
 - c. Type: Single-speed side sliding.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors: Satin stainless steel, No. 4 finish.
 - f. Sills: Aluminum.
 8. Hall Fixtures: Satin stainless steel, No. 4 finish.
 9. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from polished stainless steel, No. 8 finish.
 - b. Provide hooks for protective pads and one complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

- A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
1. Pump shall be submersible type with submersible squirrel-cage induction motor and shall be suspended inside oil tank from vibration isolation mounts.
 2. Motor shall have solid-state starting.
 3. Motor shall have variable-voltage, variable-frequency control.
- B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.
- C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

- D. Hydraulic Fluid: Elevator manufacturer's standard fire-resistant fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.
- E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- F. Car Frame and Platform: Welded steel units.
- G. Guides: Roller guides. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

2.6 DOOR-REOPENING DEVICES

- A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES

- A. General: Provide enameled- or powder-coated-steel car enclosures to receive removable wall panels, with car roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 - 1. Subfloor: Exterior, underlayment-grade plywood, not less than 5/8-inch nominal thickness.
 - 2. Floor Finish: Specified in Section 09 65 19 "Resilient Tile Flooring".
 - 3. Stainless-Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless-steel sheet.
 - 4. Fabricate car with recesses and cutouts for signal equipment.
 - 5. Fabricate car door frame integrally with front wall of car.
 - 6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 - 7. Sight Guards: Provide sight guards on car doors.
 - 8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
 - 9. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
 - 10. Light Fixture Efficiency: Not less than 35 lumens/W.
 - 11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 - 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities

having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 deg F.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.

2. Stainless-Steel Frames: Formed from stainless-steel sheet.

3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

4. Sight Guards: Provide sight guards on doors matching door edges.

5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.

2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet with telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service.

E. Car Position Indicator: Provide digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide manufacturer's standard wall-mounted units.

2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.

3. Provide telephone jack in each unit for firefighters' two-way telephone communication service.

G. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

I. Hall Position Indicators: Provide digital-display-type position indicators, located above hoistway entrance at ground floor.

1. Integrate ground-floor hall lanterns with hall position indicators.

- J. Standby-Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.
- K. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.
- D. Textured Stainless-Steel Sheet: ASTM A240/A240M, Type 304, with embossed texture rolled into exposed surface.
- E. Stainless-Steel Bars: ASTM A276, Type 304.
- F. Stainless-Steel Tubing: ASTM A554, Grade MT 304.
- G. Aluminum Extrusions: ASTM B221, Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Lubricate operating parts of systems as recommended by manufacturers.
- E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- F. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:
 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 2. Provide strippable protective film on entrance and car doors and frames.
 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 5. Do not load elevators beyond their rated weight capacity.
 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of two hours or less.
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of four hours or less.

END OF SECTION 14 24 00

SECTION 21 05 10 - BASIC REQUIREMENTS FOR FIRE PROTECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 INTENT

- A. It is the intention of these specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use."
- B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
- C. The term "Basis of Design" used throughout this document shall be understood to mean a particular manufacturer's equipment (as scheduled specifically on the drawings or specifications) has been used as the basis by the Design Engineer to establish physical dimensions, quality, and performance required, in addition to providing a basis for interaction with other ancillary components and/or other trades. Therefore, it shall be understood that use of a piece of equipment other than that identified as the Basis of Design may impact performance of an overall engineered system or may require revisions to ancillary interfacing equipment, and thus any manufacturer's equipment other than that listed as Basis of Design shall require written approval via Addendum prior to bid except where the manufacturer's name is specifically listed in these specifications as a preapproved substitute or an accepted manufacturer. All substitutes, pre-approved substitutes, accepted manufacturers, and/or Basis of Design are subject to all requirements of quality, physical characteristics (i.e., dimension, sound, etc), and performance, etc., as set forth in these specifications and contract documents.

1.3 SURVEYS AND MEASUREMENTS

- A. Base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work. All material take-offs for the site shall be field measured prior to bids.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Architect.
- B. If directed by the Architect or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- C. At the time of each shop drawing submission, the Contractor shall call the Engineer's attention (in writing) to, and plainly mark on shop drawings, any deviations from the Contract Documents. (See Paragraph 1.06, B.)
- D. Samples, drawings, specifications, and catalogs submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, location, section and article number of specifications governing, Contractor's name, and name of job. All equipment shall be labeled to match labeling on contract documents.
- E. Control Systems: Submit description of operation and schematic drawings of the entire control system. Include bulletins describing each item of control equipment or component.

- F. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.
- G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.
- H. All shop drawings shall be submitted to the A/E by Contractor no later than 30 days from the day of contract award.
- I. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.
- J. Submit all Division 21 submittals at one time in one integral group. Piece-by-piece submission of individual items will not be acceptable. Engineer may check contents of each submittal set upon initial delivery; if not complete as set forth herein, submittal sets may be returned to Contractor without review and approval and will not be accepted until made complete.
- K. Routing and methods of support of piping shall be shown on shop drawings and shall have the review of the Engineer prior to fabrication and installation. Spacing of supports shall be as specified in Sections 21 10 00 Water Based Fire Protection Systems, or if not specified, shall not exceed the suggested maximum spacing recommended in NFPA 13 for each type of line. Supports shall be fabricated as detailed on reviewed shop drawings. Provide supports so located that temporary supports are not required during removal of valves or equipment. Insofar as possible, support lines directly from Building structure.
- L. At the close of the job, prior to final review, three (3) bound copies of the following shall be submitted by transmittal letter to the Engineer for review and acceptance:
 - 1. Equipment warranties;
 - 2. Contractor's warranty;
 - 3. Parts list and manuals for all equipment;
 - 4. Balance and test readings;
 - 5. Operating instructions (in writing);
 - 6. Written instructions on maintenance and care of the system.

1.5 SUBMITTALS

- A. Submit Manufacturer's published technical data, catalog cuts, wiring diagrams, shop drawings, samples and testing and balancing logs for all elements of the Fire Protection work. Submit under provisions of General Conditions and Supplementary General Conditions.
- B. No equipment, piping, or components shall be fabricated, delivered, erected, or connected other than from shop drawings reviewed and approved by the Engineer.
- C. It shall be understood that review of shop drawings by the Engineer does not supersede the requirement to provide a complete and functioning system in compliance with the Contract Documents.
- D. Equipment Supports: Submit detailed shop drawings indicating equipment weight and dimensions, support material, connections, anchoring, and vibration isolation.
- E. Submittals shall include, but not be limited to the following:
 - 1. Pipe, valves, etc.

1.6 SUBSTITUTIONS

- A. Materials and equipment are specified herein by a single or by multiple Manufacturers to indicate quality and performance required. The drawings are based upon equipment scheduled on drawings

and specified. If another Manufacturer is considered for substitution during the bidding process, the Fire Protection Contractor shall be responsible for coordinating all electrical, mechanical, structural, or architectural changes. Comparable equipment Manufacturers which are listed below equipment indicated as "Basis of Design" shall be considered as substitutes. Manufacturers other than the Basis of Design shall submit catalog information and 1/4" scale plan and section drawings showing proper fit and all clearances for maintenance items.

- B. Substitutions of other Manufacturer's will be considered for use if, in the Engineers opinion, the item requested for substitution is equal to that specified. The Contractor shall provide to the Engineer a typed comparative list of the basis of design and the proposed substitute. The comparative shall list capacities, pressure drops, horse power, electrical requirements, etc., (refer to Paragraphs 1.04.C and 1.06.C). Request for approval of substitutions shall be made in writing in accordance with Division 01 and at least ten (10) days prior to bid. Substitutions shall not be considered approved unless the approval appears in an Addendum or unless so named in the specifications as a pre-approved substitute. The approval of any substitutions or equals prior to bid shall not be construed as a shop drawing approval. The substitute or equal must be submitted as described in the specifications and meet all the requirements of the specifications and drawings and have Owner's written approval.
- C. All requests for substitutions shall be submitted as described in paragraph 1.06, B., and specifically indicate any and all differences or omissions between the product specified as basis of design and the product proposed for substitution. Differences shall include, but shall not be limited to, data as follows for both the specified and substituted products.
 - 1. Principle of operation
 - 2. Materials of construction or finishes
 - 3. Thickness or gauge of materials
 - 4. Weight of item
 - 5. Deleted features or items
 - 6. Added features or items
 - 7. Changes in other Contractor's work caused by the substitution
 - 8. Physical dimensions
 - 9. Electrical requirements
- D. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or electrical, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted to the Architect/Engineer and Owner for approval.
- E. Where such approved deviation requires quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.7 COOPERATION WITH OTHER TRADES

- A. Give full cooperation to other trades and furnish in writing to the General Contractor, with copies to the Architect, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.
- B. When work installed under this Division will be in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer/Architect, prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'0", clearly showing how work is to be installed in relation to the work of other trades. If the work is installed before coordinating with other trades, or so as to cause any interference with work of other trades, make all the necessary changes in work to correct the condition without extra charge.

- C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.8 PROTECTION

- A. Protect all work and material provided under this Division from damage. All damaged equipment work or material provided under this Division shall be replaced with new. Rebuilds are not acceptable.
- B. Protect all work and equipment until inspected, tested, and accepted. Protect work against theft, injury, or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

1.9 SCAFFOLDING, RIGGING, AND HOISTING

- A. Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.10 REMOVAL OF RUBBISH

- A. This Contractor shall at all times keep premises free from accumulations of waste materials or rubbish caused by his employees or work. At completion of work he shall remove all his tools, scaffolding, materials, and rubbish from the building and site. He shall leave the premises and his work in a clean, orderly, and acceptable condition.
- B. All plaster, concrete, cement, etc. shall be removed from all pipe, hangers, and equipment prior to painting and/or concealment.

1.11 SAFETY

- A. This Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.333), Title 29—Labor, Chapter XIII, Bureau of Standards, Department of Labor, Part 1518—Safety and Health Regulations for Construction; and that his housekeeping and equipment be maintained in such a manner that they comply with the Florida Industrial Commission Safety Code and Regulations of the Federal WilliamsSteiger Occupational Safety and Health Act of 1970 (OSHA), wherein it states that the Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

1.12 SUPERVISION

- A. This Contractor shall provide a competent, experienced, full time superintendent who is acceptable to the Architect/Engineer and Owner, and who is authorized to make decisions on behalf of the Contractor.

1.13 LUBRICATION

- A. Where necessary, provide means for lubricating all bearings and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a lubrication tube with suitable fitting to an accessible location and suitably identify it.
- B. After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated until final acceptance by the Owner.

1.14 VALVE CHARTS, TAGS, AND NAMEPLATES

- A. Provide at a location designated by the Engineer and the Owner, a valve chart enclosed in an aluminum frame with clear plastic shield. Chart shall show the designated number of each valve, its location and service. Valve numbers shall be same as those shown on the "As-Built" drawings.

- B. Each valve shown on the chart shall have a 1-1/2" diameter, 18 gauge brass tag with clearly visible stamped numbers, securely fastened to the valve stem or handle with a heavy brass hook or chain.
- C. Each panel mounted switch, thermometer, gauge, or controller for fans, pumps, or other electrically operated equipment shall be clearly designated by a black plastic nameplate of size approved by the Engineer securely fastened with metal pins or screws to the panel directly under the item designated.
- D. Refer to Identification requirements in applicable design Sections for additional information.

1.15 WIRING DIAGRAMS

- A. Furnish for use under Division 26 00 00, Electrical all wiring diagrams as may be required for the installation of the wiring to insure proper operation and control of the equipment provided under this Division. Provide the diagrams in time to avoid delays.

1.16 MATERIAL AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Engineer shall be furnished. Refer to substitutions in this Section.
- B. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Architect and Engineer in accordance with the recommendations of the Manufacturer. This includes the performance of such tests as the Manufacturer recommends.

1.17 QUIET OPERATION AND VIBRATION

- A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer and the Owner. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer and the Owner shall be corrected in an approved manner at no additional expense to the Owner. Vibration control shall be by means of approved vibration eliminators in a manner as specified in the applicable design Specifications for Vibration.

1.18 ACCESSIBILITY

- A. This Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with all other Contractors whose work is in the same space, and shall advise them of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.
- B. This Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to, valves, traps, clean-outs, motors, controllers, switchgear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.
- C. This Contractor shall provide the access panels for concealed mechanical equipment, valves, controls, dampers, or other device requiring service. (Refer to Paragraph 1.20 of this section.)

1.19 FOUNDATIONS, SUPPORTS, PIERS, AND ATTACHMENTS

- A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all fire protection equipment, piping, and for all other equipment furnished under this Division, and shall submit drawings to the Architect and Engineer for approval before purchase, fabrication or construction of same.
- B. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect and the Engineer, not strong enough shall be replaced as directed.

1.20 ACCESS DOORS FOR WALLS AND CEILINGS

- A. Provide flush panel access doors with a 16 gauge steel frame and a 14 gauge steel door panel.
- B. Finish is to be primed painted steel.
- C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.
- D. Provide access doors with a locked flush mounted vandal proof spanner head operated steel cams.
- E. Provide 1-1/2 hour "B" label door for rated chase walls.
- F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.
- G. Provide a minimum 2'-0" by 2'-0" access doors unless shown or noted otherwise on the drawings.
- H. Access doors for chase walls shall be mounted 16" off the finish floor.
- I. Access doors for mechanical equipment shall be a minimum of 12" larger than equipment all around.

1.21 VALVE BOXES – NOT USED

1.22 WELDING

- A. Welded pipe joints shall be made by the oxyacetylene or electric process in accordance with the Code of Pressure Piping ASA B31.1.
- B. Welding shall be done with good quality modern welding equipment, by competent operators, and in thorough, first class manner, conforming to AWS Standards.
- C. The Contractor shall be required to furnish proof of the competency of each welding operator for both field and shop welds and shall at the request of the Architect/Engineer have all or any of such welding operators pass a standard qualification test such as ASME, AWS, or Hartford Insurance Company procedure and tests.
- D. Filler-metal for the welding process shall conform to ASTM A233 "Specification for Mild Steel Arc-Welding Electrodes". Classification of electrodes shall be one of the following: E6010, E6015, E7016, E7018.
- E. When welding is to be performed, precautionary measures must be taken to prevent fire. Remove flammable materials and debris from the area. Provide an appropriate extinguisher nearby.
- F. Pipes shall be cut short and cold sprung into place before welding or fabricating to compensate for expansion of lines when hot.
- G. Welds shall be of the single vee butt type. Pipe end shall be shop beveled to 45 degrees to within 1/16 inch of the inside wall surface.
- H. The abutting ends of the joints shall be separated before welding to permit complete fusion, tacked in two or more points to maintain alignment, and welded. Welding shall be continuous around the pipe.
- I. Welds shall be of sound weld metal, thoroughly fused into the ends of the pipe and to the bottom of the vee, and shall be built up in excess of the pipe wall to give a reinforcement of one-quarter (1/4) the pipe wall thickness and in such a manner that one weld metal will present a gradual increase in thickness from the surface of the pipe to the center of the weld. The minimum width of the weld shall be 2-1/2 times the pipe wall thickness.
- J. The fillet welds from the flanges of fittings shall be fused into the pipe and plate for minimum distance of 1-1/2 times the pipe wall thickness and shall be built up to present a minimum throat thickness of depth of weld of 1-1/4 times the pipe wall thickness.
- K. Branch connections shall be fabricated by welding. Openings cut into pipe for welded connections shall be accurately made to give carefully matched intersections and welding fittings shall be carefully welded into the pipe system.
- L. Welding ells shall be used at all turns in welded pipe lines; no mitered ells will be approved.

- M. Where branch piping is three times smaller than the main, branch connections shall be made up with the appropriate manufactured weld-on fitting. Welded tees shall be used for all other branch connections, unless otherwise approved by the Architect/Engineer for a specific case.
1. Approved Manufacturers:
 - a. Allied Piping Products
 - b. Bonney Forge
 - c. Branch Connections
 - d. Branchlets
 - e. Tube Turn
 - f. Thread-O-Lets
- N. Welds in piping shall be annealed after welding to remove the welding strains. The temperature need not exceed that causing a dull red, and shall be uniform around the pipe. Welds made in place shall be annealed, but the pipe shall be free to expand and shall be properly supported so as to avoid stresses. Annealing shall always be followed by slow cooling.

1.23 REGULATORY REQUIREMENTS

- A. Conform to applicable Codes and Standards as follows:
1. Standard: Certain standard materials and installation requirements are described by reference to standard specifications. These standards are as follows:

ASA	American Standards Association.
ASTM	American Society for Testing Materials.
ASME	American Society of Mechanical Engineers Code of Unfired Pressure Vessels.
NEMA	National Electrical Manufacturers Association.
NFPA	National Fire Protection Association
UL	Underwriters Laboratories.
ANSI	American National Standards Institute.
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association.
AMCA	Air Moving and Conditioning Association.
ARI	Air Conditioning and Refrigeration Institute.
AMA	Acoustical Materials Association.
 2. For additional standards and requirements see other sections of the specifications.
 3. Whenever a reference is made to a standard, installation and materials shall comply with the latest published edition at the time project is bid unless otherwise specified herein.
- B. CODES AND RULES
1. All material furnished and all work installed shall comply with the following codes as they apply to this project:
 - a. National Electric Code.
 - b. Applicable County, State and Local Building Codes.
 - c. Local and State Fire Marshal Rules and Regulations.
 - d. Occupational Safety and Health Agency Standards (OSHA).
 - e. Florida State Board of Health Rules and Regulations.
 - f. Florida Building Code.

- g. Chapter 4A-47, Florida Administrative Code - Uniform Fire Safety Standards for Elevators.
 - h. State Requirements for Educational Facilities (SREF), Chapter 4, Section 453, of the Florida Building Code.
2. Applicable codes shall be those adopted by the Authority Having Jurisdiction (AHJ) at the time project is bid.

C. PERMITS, FEES, AND INSPECTIONS

- 1. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all necessary approvals of all governmental departments having jurisdiction.
- 2. Obtain all required certificates of inspection for his work and deliver to the Owner/Engineer the same certificates before request for acceptance and final payment for the work.
- 3. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.
- 4. The Contractor shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.24 SCOPE OF WORK

- A. The scope of the work included under this Division of the Specifications shall include complete mechanical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipment, machinery, plant, and any and all other items necessary to complete the fire protection systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.
- B. Systems shall include all appurtenances as required to achieve the operating conditions as shown and specified and shall result in a superior installation.
- C. Scope of work shall include, but not be limited to, the following:
 - 1. Demolition
 - a. As noted on drawings.
 - 2. New Work
 - a. As noted on drawings.
- D. Any equipment submitted for prior approval shall be submitted with the following written information specifically for the submitted project application: specific model numbers, dimensional data, performance data and other data as requested by the Engineer. General or ambiguous submittals will not be considered for prior approval.

1.25 REMOVALS, RELOCATIONS, RECONNECTIONS, AND RESTORATIONS

- A. Demolition of existing piping, equipment, etc., shall be done as indicated on the Drawings. Existing piping and/or equipment to be removed shall be offered to the Owner. If the Owner wishes to utilize the existing equipment elsewhere, this Contractor shall move the equipment to a site designated by the Owner. All material to be removed shall be discarded by the Contractor and they shall not be used again.
- B. All demolition work shall be completely coordinated with the Owner. Demolition and reconnections requiring shut-down of existing systems shall be scheduled with the Owner/Engineer. If shut-down can only be accommodated on the weekend, or after normal working hours, such work shall be done at no additional cost to the Owner. If it is not possible to schedule sufficient Owner coordinated and approved downtime to complete the entire demolition and reconnection scope such that all or a part of the facility's service(s) will be disrupted, affecting the normal business operation of the facility (i.e., loss

of HVAC or plumbing), the Contractor shall provide temporary accommodations (i.e., temporary HVAC or portable toilets, etc), for the duration of the shutdown at no additional cost to the Owner.

- C. Location, capacity, size, etc. of existing equipment, piping, etc., was obtained from field survey and as built drawings. Verify all conditions at site prior to commencing with work. Notify Engineer of any discrepancies prior to starting work or ordering material.
- D. Survey existing facilities and utilities as necessary to determine location of shut-off or disconnect devices, drains, vents, etc. Drain, refill, and purge existing water piping circuits to make new piping connections. It is the Contractor's responsibility to verify the existing piping and identify which is supply and return, chilled water, and hot water, prior to starting demolition for new piping connections.
- E. Temporarily store all items to be relocated, if required. Contractor shall be responsible for safe storage of all such items and shall replace any items lost or damaged during storage removal or reinstallation.

1.26 PROJECT/SITE CONDITION

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of Owner/Engineer before proceeding.

1.27 TRENCHING AND BACKFILLING

- A. For requirements for trenching and backfilling, refer to Division 2.

1.28 CLOSE-OUT DOCUMENTS

- A. This Contractor shall furnish Operating and Maintenance (O&M) manuals and As-built drawings before final payment will be issued.
 - 1. O&M manuals shall be submitted in accordance with Division 01, General Requirements, and shall consist of the following (at a minimum):
 - a. All Contractor and Manufacturer warranties.
 - b. List of Contractors and Parts and Equipment Suppliers—complete with contact person, proper company name, address, and telephone numbers.
 - c. Parts list for supplied equipment—including a checklist of recommended components to be stocked on-site.
 - d. Maintenance and replacement parts manuals.
 - e. Start-up and shutdown operating instructions.
 - f. Manufacturer's literature describing the equipment, which shall include wiring diagrams and operating specifications.
 - g. Control system sequence of operation, system diagram, and backup disks of the system configuration.
 - h. Copies of final test and balance reports.
 - 2. As-built drawings shall consist of AutoCAD drawings (plotted vellums) and copies of each AutoCAD file on floppy disk. If the original construction document is not an AutoCAD produced document, mylar sepias will be acceptable in lieu of plotted vellums and disks.

1.29 EXISTING CONDITIONS-EQUIPMENT AND SYSTEMS

- A. For purposes of this Contract, the assumption during bidding is that any and all existing fire alarm, intercom, security, lighting, electrical systems, etc., are complete and operating properly.
- B. Before commencing any work on fire alarm, security alarm, energy management, intercom, lighting, or electrical systems, or any work which affects them, the Specialty Contractor shall examine such systems thoroughly. If this Contractor finds any portion of any system not functioning fully and properly, he shall notify the Project Architect/Engineer (PA/E) and the City of Tampa Inspector in

writing exactly and precisely which item(s) are not working. (This paragraph does not require diagnosis as to why such item(s) are not working nor the repair of such.)

- C. Upon notification to the Owner, the PA/E and SBA Inspector shall verify whether such report is accurate. If found not accurate, the PA/E and the SBA Inspector shall demonstrate such to this Contractor. If the report is found accurate, the Owner may either:
 - 1. Correct such deficiencies with his own Maintenance forces or by employing another Specialty Contractor.
 - 2. Require of the Contractor for this construction project a proposal sum to thoroughly diagnose the cause of such deficiencies and the specifying of precise corrective action needed.
 - 3. Upon receipt of such proposal sum, the Owner may elect to employ the Contractor, by Change Order, to effect such corrections; or, with the Contractor's approval, employ the Contractor's appropriate Specialty Contractor directly by Purchase Order, to effect such corrections; or the Owner may achieve corrections to the system by other means.
- D. However, upon commencing any work under this Contract on fire alarm, security alarm, energy management, lighting, intercom, or electrical systems under this Construction Contract, this Contractor has accepted the systems as complete and functioning properly. From the time of commencing work on such systems, they become the responsibility of this Contractor to maintain and keep functional through the Date of Final Substantial Completion. If, at the time of Final Substantial Completion, such a system or portion of such system is found not to be functioning properly, such item shall be listed on the "punchlist" and shall be corrected by this Contractor. Once corrected, inspected by the PA/E and SBA Inspector and found to be functioning properly, the item shall be removed from the "punchlist" as satisfied.
- E. The guarantees, warranties, and obligations of this Contractor for this work under this Contract shall not be extended to include the existing fire alarm, security alarm, other alarm systems, intercom, lighting, energy management and electrical systems beyond the date of final acceptance of the work under this Contract.

1.30 PAINTING

- A. Refer to Specification 09 90 00, Painting and Coating. The use of any other painting products shall be approved in writing by the Architect/Engineer and Owner.

PART 2 – PRODUCTS – NOT USED

PART 3 – INSTALLATION - NOT USED

END OF SECTION 21 05 10

SECTION 21 08 01 - TESTING OF FIRE SPRINKLER PIPING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Sprinkler Pipe

1.3 RELATED WORK

- A. Section 21 10 00 Water Based Fire Protection Systems

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Furnish all labor, materials, and equipment required for testing procedures.
- B. Insulation shall not be applied until pressure testing has been completed. Joints of any type shall not be painted or varnished prior to testing.
- C. Lines containing check valves shall have the test pressure source located upstream of the valves, or the valve discs shall be removed until after the testing. Control valves shall be set in the open position, unless directed otherwise.
- D. Pipe testing shall be performed after flushing, except for buried lines.
- E. Any equipment that has a pressure rating not as high as the testing pressure shall be valved off during the test.
- F. The tabulated results of all tests shall be submitted to the Architect/Engineer (A/E).
- G. Water Piping Systems: Test all pipe lines installed with a water pressure test of 1-1/2 times its operating pressure, but not less than 125 psi for a period of 4 hours, during which time the pressure shall remain constant without pumping. If leaks or defects develop, new tests shall be made and repeated until all defects are remedied. Pipes or joints which leak shall be taken apart and remade. Caulking will not be permitted. Pipes which will be concealed may be tested separately before the distribution system is installed in order that these lines may be covered and furred in and thus, not delay the work of other trades.

END OF SECTION 21 08 01

SECTION 21 10 00 - WATER BASED FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK:

- A. Extent of fire protection work is indicated on drawings and schedules, and by requirements of this section.
- B. Refer to other specification sections for fire protection piping and appurtenances exterior to building, fire extinguishers, and fire extinguisher cabinets and accessories; not work of this section.

1.3 QUALITY ASSURANCE:

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firm with at least 3 years of successful installation experience on projects with fire protection work similar to that required for project and a Class I or II Florida Fire Protection Contractor License.
- C. **Codes and Standards:**
 - 1. **NFPA Compliance:** Install fire protection systems in accordance with NFPA 13 "Standard for the Installation of Sprinkler Systems", NFPA 24, Florida Fire Prevention Code, and the State Requirements for Educational Facilities.
 - 2. **UL Compliance:** Provide fire protection products in accordance with UL standards; provide UL label on each product.
 - 3. **FM Compliance:** Provide fire protection products and installations in accordance with FM standards; provide FM label on each product.
 - 4. **Fire Department/Marshal Compliance:** Install fire protection systems in accordance with local regulations of fire department or fire marshal.
 - 5. **Screw Thread Connections:** Comply with local Fire Department/ Marshal Regulations for sizes, threading and arrangement of connections for fire department equipment to standpipe systems.

1.4 SUBMITTALS:

- A. **Product Data:** Submit manufacturer's technical product data and installation instructions for fire protection materials and products.
- B. **Working Plans:** Prepare 1/8" scaled layout drawings for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface and spatial relationship between piping and proximate equipment. Plans shall be signed and sealed by a delegated Professional Engineer Registered in the state of Florida and submitted to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation. **PRIOR TO ISSUING PLANS, THE DELEGATED PROFESSIONAL ENGINEER SHALL REQUEST PERMISSION, IN WRITING, TO BECOME ENGINEER OF RECORD TO HARRY W. PORTELLOS, P.E.. #61597. UPON RECEIPT OF REQUEST, HARRY W. PORTELLOS, P.E.. #61597 WILL RELINQUISH TITLE OF ENGINEER OF RECORD, IN WRITING, TO THE ENGINEER OF RECORD STATED ABOVE.**
- C. **Hydraulic Calculations:** Prepare hydraulic calculations of fire protection systems. Calculations shall be signed and sealed by a Professional Engineer Registered in the state of Florida and submitted to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation. **PRIOR TO ISSUING CALCULATIONS, THE DELEGATED PROFESSIONAL ENGINEER SHALL REQUEST PERMISSION, IN WRITING, TO BECOME ENGINEER OF RECORD TO HARRY W. PORTELLOS, P.E.. #61597. UPON RECEIPT OF REQUEST, HARRY W. PORTELLOS, P.E.. #61597 WILL RELINQUISH TITLE OF ENGINEER OF RECORD, IN WRITING, TO THE ENGINEER OF RECORD STATED ABOVE.**

- D. Certificate of Installation: Submit certificate upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and NFPA 24, and also that system is operational, complete, and has no defects.
- E. Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products; in accordance with requirements of Division 00.
- F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculations, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection systems. Where more than one type of materials or products are indicated, selection is Installer's option. All items of similar type shall be by the same manufacturer. Materials, sprinkler devices, pipe fittings, valves and hangers provided for the system shall be on the approved or acceptable list of the 2010 issue of Inspected Fire Protection Equipment and Materials, as published by the Underwriters Laboratories, Inc. and shall be NFPA approved, as well as acceptable to the underwriters and the District.
- B. Any steel pipe, supports, or anchorage exposed to weather shall to be hot dipped galvanized. Zinc electroplate or painting will not be acceptable.

2.2 BASIC IDENTIFICATION:

- A. General: Provide identification complying with Division 22 specification section "Mechanical Identification", in accordance with the following listing:
 - 1. Fire Protection Piping: Plastic pipe markers.
 - 2. Fire Protection Signs: Provide the following signs:
 - a. At each control valve, sign indicating what portion of system valve controls.
 - b. At each alarm valve, sign indicating what authority to call if device is activated.
 - c. At each test valve, sign indicating what portion of system valve controls.
 - d. At each drain valve, sign indicating what portion of system valve controls.
 - 3. Signs shall be minimum 20 gauge sheet metal, pickled and treated, with baked on enamel white lettering and border on red background.

2.3 BASIC PIPES AND PIPE FITTINGS:

- A. General: Provide pipes and pipe fittings complying with Division 22 specification section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Piping 2-1/2" and larger shall be schedule 10 lightwall. Piping 2" and smaller shall be Allied XL or Schedule 40.
 - 2. Any fire sprinkler piping at an exterior location or exposed to climate shall be hot dipped galvanized piping.
- C. Manufacturer of Above Ground Piping: Subject to compliance with requirements, provide fire protection above ground piping of one of the following or approved equivalent:
 - 1. Allied Tube and Conduit
 - 2. Bull Moose Tube Co.
 - 3. Wheatland Tube Co.
 - 4. Or approved equivalent.
- D. Manufacturer of Threaded Fittings: Subject to compliance with requirements, provide threaded fittings of one of the following or approved equivalent:
 - 1. Star

2. Anvil
 3. Reliable
 4. Or approved equivalent.
- E. Manufacturer of Grooved Mechanical Fittings: Subject to compliance with requirements, provide grooved mechanical fittings of one of the following or approved equivalent:
1. Victaulic
 2. Gruvlock
 3. Star
 4. Or approved equivalent.
- F. Manufacturer of Cast Iron Flanged Fittings: Subject to compliance with requirements, provide cast iron flanged fittings of one of the following or approved equivalent:
1. Viking
 2. Anvil
 3. Reliable
 4. Or approved equivalent
- 2.4 BASIC PIPING SPECIALTIES:
- A. General: Provide piping specialties complying with Division 22 specification section "Piping Specialties", in accordance with the following listing:
1. Pipe escutcheons.
 2. Dielectric unions.
 3. Drip pans.
 4. Pipe sleeves.
 5. Sleeve seals.
 6. Fire Barrier Penetration Seals.
- 2.5 BASIC SUPPORTS AND ANCHORS:
- A. General: Provide supports and anchors complying with Division 22 specification section "Supports and Anchors", in accordance with the following listing:
1. Adjustable steel clevis hangers, adjustable steel band hangers, or adjustable band hangers, for horizontal-piping hangers and supports.
 2. Two-bolt riser clamps for vertical piping supports.
 3. Steel turnbuckles and malleable iron sockets for hanger-rod attachments.
 4. Top-beam C-clamps, side beam or channel clamps or center beam clamps for building attachments.
 5. Hangers and rods shall be galvanized.
 6. Hangers shall be UL listed and FM approved.
- B. Piping for drainage shall be Schedule 40 galvanized steel pipe ASTM A795 or A135 with galvanized fittings.
- C. See drawings for additional piping requirements.
- 2.6 BASIC VALVES:
- A. General: Provide valves complying with Division 22 specification section "Valves", in accordance with the following listing:
1. Interior Valves:
 - a. Sectional: Gate valves or butterfly valves; UL listed.
 - b. Check: Swing check valves; UL listed.
- B. Manufacturer of Valves: Subject to compliance with requirements, provide valves of one of the following or approved equivalent:
1. Tyco-Central
 2. Reliable

3. Victaulic
4. Or approved equivalent.

2.7 SPECIAL VALVES:

- A. General: Provide valves, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
- B. Alarm Check Valve: Provide cast-iron water flow alarm check valve, 175 psi working pressure.
- C. Hose Outlet Valves: Provide angle hose valves, 2-1/2" size where not otherwise indicated.
- D. Fire Department Connection Valve: Provide fire department connection iron swing check valve, 175 psi rated working pressure, of size and end type indicated.
- E. Angle Hose Valve: Provide angle hose valve of type and in cabinet as required by drawing notes., with cast brass body and solid cast aluminum red wheel handle, UL listed and FM approved.

2.8 BASIC METERS AND GAGES:

- A. General: Provide meters and gages complying with Division 22 specification section "Meters and Gages", in accordance with the following listing:
 1. Pressure gages, 0-250 psi range.

2.9 FIRE PROTECTION SPECIALTIES:

- A. General: Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
- B. Water Flow Indicators: Provide vane type water flow detectors with adjustable retard setting from 0 to 70 seconds.
- C. Supervisory Switches: Provide products recommended by manufacturer for use in service indicated.
- D. Manufacturer: Subject to compliance with requirements, provide fire protection specialties of one of the following or approved equivalent:
 1. Allen (W.D.) Mfg. Co.; Div. of J.W. Moon, Inc.
 2. Croker-Standard Div.; Fire-End & Croker Corp.
 3. Elkhart Brass Mfg. Co., Inc.
 4. Grinnell Fire Protection Systems Co., Inc.
 5. Grunau Sprinkler Mfgr. Co., Inc.
 6. Guardian Fire Equipment, Inc.
 7. Potter Roemer, Inc.
 8. Western Fire Equipment Co.; Div. of Premier Industrial.
 9. Or approved equivalent.
- E. Provide inspector's test and drains with 2 view windows.

2.10 AUTOMATIC SPRINKLERS:

- A. General: Provide automatic sprinklers of type indicated on Drawings, and in accordance with the following listing.
 1. Standard Upright
 2. Standard Recessed pendent
 3. Extended coverage recessed pendent
 4. Standard sidewall.
 5. Concealed pendent
- B. Finish: Chrome plate for occupied areas, cast brass for unoccupied areas.
- C. Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store number of sprinklers required by NFPA13 and wrench sized to sprinklers. Locate cabinet near riser.

- D. Manufacturer: Subject to compliance with requirements, provide automatic sprinklers of one of the following or approved equivalent:
1. Tyco-Central
 2. Reliable
 3. Viking
 4. Or approved equivalent

PART 3 - EXECUTION

3.1 INSPECTION:

- A. General: Examine areas and conditions under which fire protection materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Owner.

3.2 INSTALLATION OF BASIC IDENTIFICATION:

- A. General: Install mechanical identification in accordance with Division 22 specification section "Mechanical Identification".
- B. Install fire protection signs on piping in accordance with NFPA 13.

3.3 INSTALLATION OF PIPES AND PIPE FITTINGS:

- A. General: Install pipes and pipe fittings in accordance with Division 22 specification section "Pipes and Pipe Fittings". All pipe threads shall be coated against rust after cutting and being cleaned of oil.
- B. Comply with requirements of NFPA 13 and NFPA 24 for installation of fire protection piping materials. Install piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that piping systems comply with requirements and serve intended purposes.
- C. Coordinate with other work, including plumbing piping, as necessary to interface components of fire protection piping properly with other work.
- D. Install drain piping at low points of piping systems.
- E. Install hose outlet valves in piping where hose outlets are indicated.
- F. Install sectional valves in inlet piping, at bottom of each riser, and in loops as indicated.
- G. Install fire department connection check valves in piping where fire department connections are indicated.
- H. Install water flow indicators where indicated.
- I. Mount supervisory switches on each sectional valve.
- J. Install pressure gages on system side of all control valves.
- K. Install manual shutoff at each audible alarm station.
- L. Install Inspector's test connection where indicated at the fire riser.

3.4 INSTALLATION OF PIPING SPECIALTIES:

- A. Install piping specialties in accordance with Division 22 specification section "Piping Specialties".

3.5 INSTALLATION OF SUPPORTS AND ANCHORS:

- A. Install supports and anchors, in accordance with Division 22 specification section "Supports and Anchors".

3.6 INSTALLATION OF VALVES:

- A. Install valves in accordance with Division 22 specification section "Valves".
- B. Detector Check Valves: Install in horizontal position as indicated, orientated for proper flow direction. Install by-pass meter with globe valve and check valve, in accordance with manufacturer's installation directions.

- C. All control, drain, and inspector's test valves shall be located within 7 feet of the floor to allow access without the aid of ladders, but shall not be located in areas accessible to the student population.
 - D. Inspectors test and main drains shall penetrate exterior walls at a maximum of 24 inches above grade and shall be provided with concrete splash blocks.
- 3.7 INSTALLATION OF METERS AND GAGES:
- A. Install meters and gages in accordance with Division 22 specification section "Meters and Gages".
- 3.8 INSTALLATION OF FIRE PROTECTION SPECIALTIES:
- A. General: Install fire protection specialties as indicated, and in accordance with NFPA 13 and 24.
 - B. Furnish wiring requirements to electrical Installer for electrical wiring of supervisory switches.
- 3.9 FIELD QUALITY CONTROL:
- A. Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.
 - B. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested. Written notification of the test shall be received by the owner a minimum of 48 hours prior to the test. The owner shall, at his option, witness the test.
 - C. Repair or replace piping system as required to eliminate leakage in accordance with NFPA standards for "little or no leakage" and retest as specified to demonstrate compliance.
- 3.10 ADJUSTING AND CLEANING:
- A. Cleaning and Inspecting: Clean and inspect fire protection systems in accordance with requirements of Division 22 specification section "Pipes and Pipe Fittings".
- 3.11 EXTRA STOCK:
- A. Heads: Per NFPA 13.
 - B. Wrenches: Furnish 2 spanner wrenches for each type and size of valve connection and fire hose coupling.
 - C. Obtain receipt from Owner that extra stock has been received.
- 3.12 FIRE STOPPING
- A. All pipes passing through rated floor or walls shall be sleeved and firestopped to or equivalent ratings of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.
- 3.13 SPRINKLER:
- A. Install sprinkler in center of ceiling tiles. It is the contractor's option to use swing joints or flexible sprinkler drops to accomplish this. Hydraulic calculations shall include losses for swing joints or flexible sprinkler drops.
- 3.14 SYSTEM INSPECTION AND CHECKOUT
- A. After the installation is complete, the system shall be inspected by factory trained personnel in accordance with the manufacturer's recommended procedure.

END OF SECTION 21 10 00

SECTION 21 13 16 – PRE-ACTION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other related Specification sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

B. Related Requirements:

1. Section 21 11 19 “Fire Department Connections” for exposed-, flush-, and yard-type fire department connections.
2. Section 23 05 23 “General-Duty Valves for Water-Based Fire-Suppression Piping” for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Pre-action sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For Pre-action sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC hydronic piping.
3. HVAC ductwork
4. Data and Electrical equipment and wiring
5. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.

B. Qualification Data: For qualified Installer.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations as a confirmation of the Architect-Engineer’s calculations. Base calculations on results of fire-hydrant flow test.

- D. Fire-hydrant flow test report.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include “Contractor’s Material and Test Certificate for Aboveground Piping.”
- F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pre-action sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer’s responsibilities include planning, coordinating, fabricating, and installing sprinkler systems.

1.9 WORK INCLUDED

- A. This section covers equipment, installation, testing and all materials required for the dry-pipe pre-action fire sprinkler protection packaged system, single interlock with electric/electric release. All equipment shall be housed in a pre-assembled and a free standing cabinet.
- B. Contractor shall be responsible for the complete system planning, coordination, layout, hydraulic calculations (to confirm Architect-Engineer’s calculations), preparation of shop drawings, field installation, coordination and completion in accordance with project requirements and applicable codes and standards.
- C. Work or equipment not indicated or specified which is necessary for the complete and proper operation of the work of this section in accordance with the true intent and meaning of the contract documents shall be provided by this Contractor and incorporated under this section of the work at no additional cost to the owner.

1.10 WARRANTY

- A. Warranty: Repair or replace components that fail in materials or workmanship. Manufacturer’s warranty shall be in the name of the Owner.
 - 1. Warranty Period: One year minimum from date of Substantial Completion, or longer if standard manufacturer’s warranty is longer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Single-Interlock Pre-Action Sprinkler System: System to provide coverage for rooms as indicated on drawings. The method of release of the deluge valve priming water pressure shall be by an electric solenoid valve and a electric actuator. The pre-action system riser shall be of a listed and approved assembly. The system riser shall be equipped with a rubber seated check valve downstream of the deluge valve and prior to the supervisory air connection. Automatic sprinklers are attached to piping containing low-pressure air. Actuation of a fire-detection system, located in same area as sprinklers, opens deluge valve, permitting water to flow into sprinkler piping. Water will then discharge from opened sprinklers. The pre-action system shall be provided with all necessary appurtenances to com-

plete the system. The system shall be installed in conformance with the current Edition of N.F.P.A. 13, Standard for Installation of Sprinkler Systems.

- B. Interface system with building fire and smoke alarm system. The fire alarm system shall monitor the pre-action system. Refer to specification section 283111 and coordinate.
- C. Provide system to hazard occupancy classification required by the authority having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13.
- B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Data Equipment Rooms: Ordinary Hazard, Group 1
 - 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - 4. Maximum Protection Area per Sprinkler: According to UL listing.
 - 5. Maximum Protection Area per Sprinkler:
 - a. Data Equipment Rooms: 130 sq. ft.
 - 6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
 - a. Ordinary-Hazard Occupancies: 250 gpm for 60 minutes.

2.3 STEEL PIPE AND FITTINGS

- A. Schedule 40, Galvanized-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, Type E or ASME B36.10M wrought steel. Pipe ends may be factory or field formed to match joining method.
- B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Galvanized-Steel Couplings: ASTM A 865/A 865M, threaded.
- D. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME B16.1, Class 125.
- G. Plain-End-Pipe Fittings: UL 213, ductile-iron body with retainer lugs that require one-quarter turn or screwed retainer pin to secure pipe in fitting.
- H. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Pressure Rating: 175-psig minimum.
 - 2. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
 - 3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18 pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22 pressure fittings.

- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
- F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- G. Copper Pressure-Seal Fittings:
 - 1. Standard: UL 213.
 - 2. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
 - 3. NPS 2-1/2 to NPS 4 : Cast-bronze fitting with EPDM-rubber O-ring seal in each end.
- H. Grooved-Joint, Copper-Tube Appurtenances:
 - 1. Grooved-End Copper Fittings: ASTM B 75 , copper tube or ASTM B 584 bronze castings.
 - 2. Grooved-End-Tube Couplings: To fit copper-tube dimensions, with design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gasket suitable for hot and cold water, and bolts and nuts.
- I. Copper-Tube, Extruded-Tee Connections:
 - 1. Description: Tee formed in copper tube according to ASTM F 2014.

2.5 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Pre-action Valves:
 - 1. Standard: UL 260.
 - 2. Design: Differential-pressure type.
 - 3. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 4. Air-Pressure Maintenance Device:
 - 5. Standard: UL 260.
 - 6. Type: Automatic device to maintain minimum air pressure in piping.
 - 7. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig 300-psig outlet pressure.
 - 8. Air Compressor:
 - Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - Motor Horsepower: Fractional.
 - Power: 120-V ac, 60 Hz, single phase.
- G. Deluge Valves:
 - 1. Standard: UL 260.
 - 2. Design: Hydraulically operated, differential-pressure type.
 - 3. Include trim sets for alarm-test bypass, drain, electrical water-flow alarm switch, pressure gages, drip cup assembly piped without valves and separate from main drain line, and fill-line attachment with strainer.
 - 4. Dry, Pilot-Line Trim Set: Include dry, pilot-line actuator; air- and water-pressure gages; low-air-pressure warning switch; air relief valve; and actuation device. Dry, pilot-line actuator includes

cast-iron, operated, diaphragm-type valve with resilient facing plate, resilient diaphragm, and replaceable bronze seat. Valve includes threaded water and air inlets and water outlet. Loss of air pressure on dry, pilot-line side allows pilot-line actuator to open and causes deluge valve to open immediately.

5. Air-Pressure Maintenance Device:
 - a. Standard: UL 260.
 - b. Type: Automatic device to maintain minimum air pressure in piping.
 - c. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
 6. Air Compressor:
 - a. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - b. Motor Horsepower: Fractional.
 - c. Power: 120-V ac, 60 Hz, single phase.
 - d. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- H. Automatic (Ball Drip) Drain Valves:
1. Standard: UL 1726.
 2. Pressure Rating: 175-psig minimum.
 3. Type: Automatic draining, ball check.
 4. Size: NPS 3/4 .
 5. End Connections: Threaded.

2.6 SPRINKLER PIPING SPECIALTIES

- A. General Requirements for Pre-action System Fittings: UL listed for pre-action service.
- B. Branch Outlet Fittings:
 1. Standard: UL 213.
 2. Pressure Rating: 175-psig minimum.
 3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 4. Type: Mechanical-tee and -cross fittings.
 5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 7. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Flow Detection and Test Assemblies:
 1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 2. Pressure Rating: 175-psig minimum.
 3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded.
- D. Branch Line Testers:
 1. Standard: UL 199.
 2. Pressure Rating: 175-psig minimum.
 3. Body Material: Brass.
 4. Size: Same as connected piping.
 5. Inlet: Threaded.
 6. Drain Outlet: Threaded and capped.
 7. Branch Outlet: Threaded, for sprinkler.
- E. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 2. Pressure Rating: 175-psig minimum.
 3. Body Material: Cast- or ductile-iron housing with sight glass.
 4. Size: Same as connected piping.
 5. Inlet and Outlet: Threaded.
- F. Adjustable Drop Nipples:
1. Standard: UL 1474.
 2. Pressure Rating: 250-psig minimum 300 psig.
 3. Body Material: Steel pipe with EPDM O-ring seals.
 4. Size: Same as connected piping.
 5. Length: Adjustable.
 6. Inlet and Outlet: Threaded.
- G. Flexible Sprinkler Hose Fittings:
1. Standard: UL 1474.
 2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 3. Pressure Rating: 175-psig minimum.
 4. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- D. Pressure Rating for High-Pressure Automatic Sprinklers: 250-psig minimum.
- E. Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199.
 2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- F. Sprinkler Finishes: Chrome plated and painted.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Aluminum, white finish, one piece, flat.
- H. Sprinkler Guards:
1. Standard: UL 199.
 2. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
1. Standard: UL 464.
 2. Type: Vibrating, metal alarm bell.
 3. Size: 6-inch minimum diameter.
 4. Finish: Red-enamel factory finish, suitable for outdoor use.
 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Pressure Switches:
1. Standard: UL 346.
 2. Type: Electrically supervised water-flow switch with retard feature.

3. Components: Single-pole, double-throw switch with normally closed contacts.
 4. Design Operation: Rising pressure signals water flow.
- D. Valve Supervisory Switches:
1. Standard: UL 346.
 2. Type: Electrically supervised.
 3. Components: Single-pole, double-throw switch with normally closed contacts.
 4. Design: Signals that controlled valve is in other than fully open position.
 5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- E. Heat Detectors:
- Heat detectors on the ceiling shall be provided as part of the pre-action sprinkler system, and shall initiate the first phase of the pre-action fire suppression system. These detectors shall be UL listed for use with the pre-action control panel and shall be completely wired and connected.

2.9 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.10 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- B. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panels Components:
 1. Power supply.
 2. Battery charger.
 3. Standby batteries.
 4. Field-wiring terminal strip.
 5. Electrically supervised solenoid valves and polarized fire-alarm bell.
 6. Lamp test facility.
 7. Single-pole, double-throw auxiliary alarm contacts.
 8. Rectifier.

2.11 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum.
- D. Label: Include "WATER" or "AIR/WATER" label on dial face.

- E. Air System Piping Gage: Include retard feature and “AIR” or “AIR/WATER” label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system hydraulic calculations required in “Quality Assurance” Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements in Section 211100 “Facility Fire-Suppression Water-Service Piping” for exterior piping.
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 “Domestic Water Piping.”
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect-Engineer before deviating from approved working plans.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install “Inspector's Test Connections” in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.
- J. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire-alarm devices, including low-pressure alarm.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13. In seismic-rated areas, refer to Section 210548 “Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.”

- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- N. Drain pre-action sprinkler piping.
- O. Pressurize and check pre-action sprinkler system piping and air-pressure maintenance devices
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- K. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- L. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install deluge valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.
 - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig Insert value adjustable range; and 175-psig maximum inlet pressure.
 - c. Install compressed-air-supply piping from building's compressed-air piping system.

3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean dirt and debris from sprinklers.

- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.11 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- D. Standard-pressure, pre-action sprinkler system, NPS 2 and smaller shall be one of the following:
 - 1. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, galvanized-steel pipe with plain ends; plain-end-pipe fittings; and twist-locked joints.
 - 3. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- E. Standard-pressure, pre-action sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:
 - 1. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.12 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
Rooms with Suspended Ceilings pendent sprinklers as indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

3.13 SEQUENCE

- A. Upon initiation of a heat detector (135 degree F type) in the protected space, the pre-action fire protection piping shall fill with water, and initiate a supervisory alarm on the fire alarm system.
- B. Upon initiation of a sprinkler head (155 degree F) the sprinkler shall flow water distribution to the space and sound the building fire alarm.

END OF SECTION 21 13 16

SECTION 21 22 00 - CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other related Specification sections, apply to this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Piping and piping specialties.
 - 2. Extinguishing-agent containers.
 - 3. Extinguishing agent.
 - 4. Detection and alarm devices.
 - 5. Control and alarm panels.
 - 6. Accessories.
 - 7. Connection devices for and wiring between system components.
 - 8. Connection devices for power and integration into building's fire-alarm system.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. EPO: Emergency Power Off.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer registered in the State of Florida.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include all design calculations.
 - 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
 - 5. Coordinate all requirements with the fire alarm system contractor and installer. Do not duplicate controls and systems. Obtain copy of fire alarm shop drawings and submit clean agent system shop drawings together for review.
- C. Delegated-Design Submittal: For clean-agent fire-extinguishing system signed and sealed by the qualified professional engineer.
 - 1. Indicate compliance with performance requirements and design criteria, including analysis data.
 - 2. Include design calculations for weight, volume, and concentration of extinguishing agent required for each hazard area.
 - 3. Indicate the Following on Reflected Ceiling Plans:
 - a. Ceiling penetrations and ceiling-mounted items.
 - b. Extinguishing-agent containers if mounted above floor, piping and discharge nozzles, detectors, and accessories.
 - c. Method of attaching hangers to building structure.
 - d. Other ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
 - 4. Indicate the Following on Occupied Work Area Plans:
 - a. Controls and alarms.

- b. Extinguishing-agent containers, piping and discharge nozzles if mounted in space, detectors, and accessories.
- c. Equipment and furnishings.
5. Indicate the Following on Access Floor Space Plans:
 - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
 - b. Method of supporting piping.
6. Indicate the Following on Ceiling Plans:
 - a. Extinguishing-agent containers, piping and discharge nozzles, detectors, and accessories.
 - b. Method of supporting piping.
 - c. Other equipment located in the ceiling space that is being protected including sprinkler piping, HVAC equipment, raceways, or conduit.
7. Coordinate all requirements with the fire alarm system contractor and installer. Do not duplicate controls and systems. Obtain copy of fire alarm shop drawings and submit clean agent system shop drawings together for review.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 1. Domestic water piping.
 2. Items Penetrating Finished Ceiling Include the Following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Life Safety fixtures.
 - d. Speakers.
 3. HVAC equipment.
 4. Data equipment.
- B. Permit Approved Drawings: Working plans, prepared according to NFPA 2001 and NFPA 75, that have been approved by authorities having jurisdiction. Include design calculations.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For special agent system to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.
 1. Detection Devices: Not less than 20 percent of amount of each type installed.
 2. Container Valves: Not less than 10 percent of amount of each size and type installed.
 3. Nozzles: Not less than 20 percent of amount of each type installed.
 4. Extinguishing Agent: Not less than 100 percent of amount installed in largest hazard area. Include pressure-rated containers with valves.

1.8 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."

- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

1.9 WARRANTY

- A. Warranty: Repair or replace components that fail in materials or workmanship. Manufacturer's warranty shall be in the name of the Owner.
 - 1. Warranty Period: One year minimum from date of Substantial Completion, or longer if standard manufacturer's warranty is longer.

PART 2 - PRODUCTS

2.1 CLEAN-AGENT SYSTEMS

- A. Description: Clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity below the ceiling and below the raised floor. System shall include one zone for below the ceiling and beneath the raised floor, where required. If smoke is detected below the ceiling or below floor, extinguishing agent shall be discharged in zones above and below the ceiling and below the floor. Each room will be shall be treated as one zone.
- B. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
- C. Performance Requirements: Discharge HFC 227ea or equivalent within 10 seconds and 7.1 percent concentration by volume at 70°F for 10-minute holding time in hazard areas.
 - 1. HFC 227ea or equivalent concentration in hazard areas greater than 9.0 percent immediately after discharge or less than 5.8 percent throughout holding time will not be accepted without written authorization from Owner and authorities having jurisdiction.
 - 2. System Capabilities: Minimum 620-psig calculated working pressure and 360-psig initial charging pressure.
- D. Verified Detection: Devices located in single zone. Sound alarm on activating single-detection device, and discharge extinguishing agent on actuating second-detection device.
- E. System Operating Sequence:
 - 1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning, ventilating systems and close HVAC dampers serving protected area, close doors in protected area, and send signal to fire-alarm system.
 - 2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds, and discharge extinguishing agent.
 - 3. Expiration of the adjustable time delay or when manual pull station is activated shall, transfer discharge relay contacts, energize release circuit with discharges the clean agent gas in the protected space. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area. Initiate building fire alarm evacuation signals.
- F. Manual stations shall immediately discharge extinguishing agent when activate and initiate the building fire alarm evacuation signals.
- G. Operating abort switches will delay extinguishing-agent discharge while being activated, and switches must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.
- H. EPO: Will terminate power to protected equipment immediately on actuation.
- I. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.
- J. Power Transfer Switch: Transfer from normal to stand-by power source.
- K. Seismic Performance: Fire-suppression piping and containers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”

2.2 PIPING MATERIALS

- A. See “HFC 227ea or equivalent Agent Piping Applications”, Article for applications of pipe, tube, fitting, and joining materials.
- B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section “Distribution,” for charging pressure of system.

2.3 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106/A 106M, Grade A; Schedule 40, Schedule 80, and Schedule 160 or seamless steel pipe.
 1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 - c. Fittings Working Pressure: 620 psig minimum.
 - d. Flanged Joints: Class 300 minimum.
 2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
 3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A 47/A 47M malleable iron or ASTM A 536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

- A. General Valve Requirements:
 1. UL listed or FM Approved for use in fire-protection systems.
 2. Compatible with type of clean agent used.
- B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.
- C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.
- D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

- A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.
 1. Finish: Red, enamel or epoxy paint.
 2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.

3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
4. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

- A. HFC 227ea Clean Agent: Heptafluoropropane.
- B. FE-25.
- C. Approved equivalent.

2.7 DISCHARGE NOZZLES

- A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

2.8 MANIFOLD AND ORIFICE UNIONS

- A. Description: NRTL-listed device with minimum 2175-psig pressure rating, to control flow and reduce pressure of IG-541 gas in piping.
 1. NPS 2 and Smaller: Piping assembly with orifice, sized for system design requirements.
 2. NPS 2-1/2 and Larger: Piping assembly with nipple, sized for system design requirements.

2.9 CONTROL PANELS

- A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.
- B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.
- C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 1. Mounting: Recessed flush with surface.
- D. Supervised Circuits: Separate circuits for each independent hazard area.
 1. Detection circuits using addressable devices assigned to the required number of zones.
 2. Manual pull-station circuit.
 3. Alarm circuit.
 4. Release circuit.
 5. Abort circuit.
 6. EPO circuit.
- E. Control-Panel Features:
 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 2. Automatic switchover to standby power at loss of primary power.
 3. Storage container, low-pressure indicator.
 4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.
- F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.
- G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

2.10 DETECTION DEVICES

- A. General Requirements for Detection Devices:
 - 1. Comply with NFPA 2001, NFPA 72, and UL 268.
 - 2. 24-V dc, nominal.
 - 3. Provide all required smoke detection devices, and associated initiation and monitoring wiring, as part of the clean agent systems. Including detectors under the floor. These are not “building” fire alarm smoke detectors.
- B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.
- C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.
- D. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the central fire alarm control panel as a composite “trouble” signal. Alarms on each system zone are individually reported to the central fire alarm control panel as separately identified zones.

2.11 MANUAL STATIONS

- A. General Description: Surface FM Approved or NRTL listed, with clear plastic hinged cover, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: “MANUAL RELEASE” caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: “ABORT” caption, momentary contact, with green finish.
- D. EPO Switch: “EPO” caption, with yellow finish.

2.12 SWITCHES

- A. Description: FM Approved or NRTL listed, where available, 120-V ac or low voltage compatible with controls. Include contacts for connection to control panel.
 - 1. Low-Agent Pressure Switches: Pneumatic operation.
 - 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
 - 3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.13 ALARM DEVICES

- A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Section 28 31 11 “Digital, Addressable Fire-Alarm System” or Section 28 31 12 “Zoned (DC Loop) Fire-Alarm System” for alarm and monitoring devices.
- B. Bells: Minimum 6-inch diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with “FIRE” or similar caption.

2.14 SIGNAGE

- A. Instructional signs shall be installed to provide a system in which the function of each device is easy to understand.
- B. At each horn/strobe within the protected space the following sign shall be provided:

WARNING
When Alarm Sounds
Vacate at Once
Extinguishing Agent
Being Released
- C. At each strobe outside the protected space the following sign shall be provided:

CAUTION

When Light Is Flashing
Agent Has Discharged

- D. At each door entering the protected space the following sign shall be provided:

2.15 KEEP DOOR CLOSED

Area Protected
By Clean Agent Fire Suppression System

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HFC 227EA OR EQUIVALENT AGENT PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.
- C. NPS 2-1/2 and Larger: Schedule 40, steel pipe; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

3.3 CLEAN-AGENT PIPING INSTALLATION

- A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.
- B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.
- C. Install extinguishing-agent containers anchored to substrate.
- D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."
1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
 2. Support piping using supports and methods according to NFPA 13.
 3. Install seismic restraints for extinguishing-agent containers and piping systems.
 4. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

3.4 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.
- B. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Section 28 31 11 "Digital, Addressable Fire-Alarm System".

3.5 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.
- C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.

- D. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
 - 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Units will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.7 CLEANING

- A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

3.8 SYSTEM FILLING

- A. Preparation:
 - 1. Verify that piping system installation is completed and cleaned.
 - 2. Check for complete enclosure integrity.
 - 3. Check operation of ventilation and exhaust systems.
- B. Filling Procedures:
 - 1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
 - 2. Install filled extinguishing-agent containers.
 - 3. Energize circuits.
 - 4. Adjust operating controls.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 21 22 00

SECTION 22 00 00 – PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Work herein shall conform to all applicable laws, ordinances, and to regulations of the local utility companies. The general conditions and all requirements of the contract documents shall apply to all work of this section. Work shall be in accordance with the requirements of:
 - 1. Florida Building Code (FBC) 6th Edition (2017): This code includes the 2017 FBC Building, Mechanical, Plumbing, Energy Conservation, Fuel Gas, Accessibility, and Test Protocols volumes. Further, see "Referenced Standards" in the FBC Building Chapter 35; FBC Mechanical Chapter 15; FBC Plumbing Chapter 14; FBC Energy Conservation Chapter 6; and FBC Fuel Gas Chapter 8) (Effective December 31, 2017).
 - 2. 6th Edition of the Florida Fire Prevention Code (FFPC): This code also includes the Florida versions of NFPA 1 and NFPA 101. (Effective December 31, 2017).
 - 3. 2014 National Electric Code.
- D. Cooperate with all other trades and install work as fast as the progress of the job will permit.
- E. Use only mechanics skilled in the work they are to perform and have a competent representative on the job when any work is being done.
- F. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.
- G. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.
- H. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.2 SPECIFICATIONS AND DRAWINGS

- A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.
- B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. Refer to Supplementary Conditions. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.
- C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job. Refer to Specification Section 017000, "Closeout" for requirements.

1.3 PERMITS, FEES AND INSPECTIONS:

- A. The Contractor shall give all necessary notices, obtain all permits and pay all government fees in accordance with the Supplementary Conditions, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all permit applications required by all governmental departments having jurisdiction.
- B. Obtain all required certificates of inspection for work and deliver them to the Owner before requesting acceptance and final payment for the work.

- C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.
- D. The Contractor shall inform the Owner of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.4 GENERAL

- A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified. Substitutions will not be permitted except as described herein and in the Supplementary and General Conditions.
- B. Since manufacturers reserve the right to change their products at any time, contractors shall verify all dimensions, performance data, etc. for each piece of equipment submitted to assure compliance with the intent of the drawings and specifications.
- C. All materials shall be new and of quality as specified, and when required, be clearly labeled and/or stamped as manufactured in the United States.
- D. Where an accepted substitution or deviation requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, contractor shall furnish said changes and additions and pay all costs for all changes and additions to his work and the work of others affected by this substitution or deviation.
- E. Deviations mean the use of any listed approved manufacturer other than those on which the drawings are based.

1.5 SHOP AND ERECTION DRAWINGS AND SAMPLES

- A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.
- B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.
- D. Prepare and submit shop drawings and submittals in accordance with Specifications Section 01 33 00 - SUBMITTAL PROCEDURES.
- E. Operation and Maintenance Manuals:
 - 1. Maintenance manuals shall be complete and shall be furnished in a loose leaf binder or in the manufacturer's standard binder. Information shall be sufficient to enable a qualified technician to perform normal first line maintenance and repair. A parts list shall be included which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
 - 2. Operation manuals shall be clear and concise and shall describe, in detail, the information required to properly operate the equipment specified. The manuals shall include complete catalog cuts and as-built wiring diagrams.
 - 3. Operation and maintenance manuals shall be submitted for approval prior to final inspection.
- F. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.6 EXPERIENCE

- A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified

personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.7 COORDINATION WITH OTHER TRADES

- A. Contractor shall coordinate his work with other trades to avoid interferences and delays. He shall assist in working out space requirements to make a satisfactory installation.
- B. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with the work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
- C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.8 STORAGE OF MATERIALS

- A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.
- B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.
- C. Provide continuous protection for all equipment already installed.

1.9 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

- A. Provide openings and excavation required for the installation of the work. Patch work and backfill as required. Finished work shall match the existing adjoining work.
- B. Verify all conditions affecting the work to be performed under this contract.
- C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations or any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Architect/Engineer.
- D. All excavation on sites containing existing buildings and existing services shall be done with hand shovel to avoid damage to existing services. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Architect/Engineer at no cost to the Owner and with no extension of time limitation.

1.10 REMOVAL OF RUBBISH

- A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work in accordance with Division 00 - Construction Procedures. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Architect/Engineer.

1.11 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

- A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 22.
- B. Power wiring for motors and installation of starters shall be under Division 26 Electrical.
- C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be under Division 22 of specifications, installed in accordance with requirements of Division 26.
- D. Motors shall be furnished under Division 22 of capacity required to operate equipment specified, but shall not be less than that specified.
- E. Furnish and install all low voltage (120V and under) temperature control wiring for equipment provided under this division.
- F. Provide conduit when required for control wiring.

1.12 MOTORS

- A. All motors shall be furnished and installed under Division 22 and shall be wired under Division 26 Electrical.
- B. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on roof mounted fan units and similar equipment.
- C. Unless indicated otherwise, motors shall be NEMA Design B with a service factor of 1.15 with total temperature rise of 90 degrees C. (resistance measured) in 40 degrees C. ambient when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 80 degrees C. in the above conditions. Motors located in areas exceeding 40 degrees C. ambient shall be factory rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Design N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.
- D. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change and shall pay all additional charges in connection with the change.
- E. All motors supplied on this project three (3) HP and larger shall have a power factor not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with this Code, shall be switched with the utilization equipment.
- F. All motors supplied on this project shall be energy efficient. All efficiency testing and labeling shall be performed in accordance with the NEMA Standard MG 1-12.54 and IEEE 112 Test Standard, Method B. Minimum efficiencies shall conform to the following listing:

Motor HP	Efficiency (%)
3/4	80.0
1	82.5
1-1/2	84.0
2	85.5
3	87.5
5	87.5
7-1/2	89.5
10	89.5
15	91.0
20	91.7

1.13 QUIET OPERATION AND VIBRATION

- A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.
- B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.14 EQUIPMENT IDENTIFICATION

- A. Each unit shall be identified by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include: supply and exhaust fans, air

conditioning and heating machinery and apparatus, pumps, piping, control cabinets, and other equipment units as may be directed by the Architect/Engineer.

1.15 CLEANING AND ADJUSTMENTS

- A. Upon completion of the work, Contractor shall clean and lubricate fans, motors, and other running equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.
- B. Scratched or damaged painting shall be touched up as necessary to return the painting to "new" condition and appearance.
- C. All piping and equipment shall be thoroughly blown out under pressure and cleared of all foreign matter, wasting air, gas or water through temporary connections as long as necessary to thoroughly clean system before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter from getting into the piping system and equipment.
- D. During blow out period, baskets from strainers shall be removed, traps and control valves, etc., shall be bypassed.
- E. All cleaning shall be done prior to any sterilization, pressure testing, flow balancing or equipment adjustment procedures.
- F. During construction protect all piping and equipment from damage and dirt. Cap the open ends of all piping and equipment.

1.16 DEMOLITION

- A. Demolition shall be as shown on drawings or specified.
- B. Schedule all demolition work with Owner to cause minimum downtime of any building service or function. No extra cost to the contract will be allowed for overtime work unless specifically authorized in advance by representative of Owner in writing.
- C. During demolition and construction protect from damage all existing equipment and services that are to remain. Repair or replace any damage to existing facilities at no extra cost to the contract.
- D. Remove with care and deliver to a location designated by representative of the Owner all items designated to remain the property of the Owner.
- E. Drawings are diagrammatic and shown only major obstructions; coordinate with other trades for removal or relocation of pipes; conduits, hangers, etc. in path of work.
- F. No columns, beams, joists, building foundations or any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Architect/Engineer. Contractor shall not proceed until instructed in writing by the Architect/Engineer if conflicts between mechanical work and structural elements occur.

1.17 CONNECTIONS TO EXISTING WORK

- A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities.
- B. Submit to the Owner for approval, a schedule of necessary temporary shut-downs of existing services. All shutdowns shall be made at such times as will not interfere with regular operating of existing facilities and only after written approval of the Owner.
- C. To insure continuous operation, make necessary temporary connections between new and existing work.
- D. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.

1.18 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.
- B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.19 TESTS

- A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Architect/Engineer. Provide all instruments, labor and services necessary to conduct tests.

1.20 INSTRUCTIONS

- A. Fully instruct Owner's personnel in the care and operation of mechanical systems and furnish a letter to the Architect/Engineer advising the particular person who has received such instruction.

1.21 WARRANTY

- A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Architect/Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written warranty covering all defects in workmanship and material for a period of one year from date of final acceptance. Any defects appearing within this one year period shall be repaired without additional cost to the Owner.

1.22 ACCEPTANCE

- A. Before requesting final inspection:
 - 1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
 - 2. Submit statement that equipment is properly installed, adjusted, fully lubricated and operation is satisfactory.
 - 3. Certify in writing to the Architect/Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Architect/Engineer.
 - 4. Submit copy of written guarantee.
 - 5. Submit copy of other data as may be outlined in these specifications.
- B. Copies of the above data shall be submitted to the Architect/Engineer prior to requesting final inspection.

1.23 FACILITY STARTUP BROCHURE

- A. At the completion of work, Contractor shall provide startup instruction in accordance with Division 00, "Closeout" and shall submit a bound brochure containing the following:
 - 1. Shop Drawings
 - 2. Maintenance Manuals
 - 3. Control Wiring and Piping Diagrams
 - 4. Operating Instructions
 - 5. Copy of Guarantee
 - 6. Certificate of Instruction of Owner's Representative
 - 7. Certificate of Job Completion
 - 8. Record Documents
- B. Where projects are of sufficient size to make a single brochure impractical, several brochures shall be prepared by trade and As-Built Drawings may be submitted as a separate item.
- C. Brochure shall be indexed and divided for reasonable clarity.
- D. Brochure shall be turned over to the Architect/Engineer for review and approval. The contractor shall make modifications to the brochure as deemed necessary for compliance and clarity, by the Architect/Engineer, and re-submit the final brochure to the Architect/Engineer to be forwarded to the Owner.

END OF SECTION 22 00 00

SECTION 22 05 19 - PLUMBING METERS AND GAGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of meters and gages required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of meters and gages specified in this section include the following:
 - 1. Temperature Gages and Fittings.
 - a. Glass Thermometers.
 - b. Thermometer Wells.
 - c. Temperature Gage Connector Plugs.
 - 2. Pressure Gages and Fittings.
 - a. Pressure Gages.
 - b. Pressure Gage Cocks.
 - c. Pressure Gage Connector Plugs.
 - 3. Flow Measuring Meters.
 - a. Wafer-Type Flow Meters.
 - b. Calibrated Balance Valves.
- C. Meters and gages furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 22 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of meters and gages, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ANSI and ISA Compliance: Comply with applicable portions of ANSI and Instrument Society of American (ISA) standards pertaining to construction and installation of meters and gages.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gage. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.
- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter and gage. Include this data and product data in Maintenance Manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 GLASS THERMOMETERS:

- A. General: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
- B. Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured, 9" long.
- C. Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.
- D. Tube and Capillary: Mercury filled, magnifying lens, 1% scale range accuracy, shock mounted.
- E. Scale: Satin faced, non-reflective aluminum, permanently etched markings.
- F. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.
- G. Range: Conform to the following:
 - 1. Hot Water: 30° - 240°F with 2°F scale divisions.
- H. Manufacturer: Subject to compliance with requirements, provide glass thermometers of one of the following or approved equivalent:
 - 1. Ernst Gage Co.
 - 2. Marshalltown Instruments, Inc.
 - 3. Trerice (H.O.) Co.
 - 4. Weiss Instruments, Inc.
 - 5. Miljoco

2.2 THERMOMETER WELLS:

- A. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.
- B. Manufacturer: Same as thermometers.

2.3 TEMPERATURE GAGE CONNECTOR PLUGS:

- A. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200°F (93°C). Construct of brass and finish in nickel-plate, equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.
- B. Manufacturer: Subject to compliance with requirements, provide temperature gage connector plugs of one of the following or approved equivalent:
 - 1. Peterson Equipment Co.

2.4 PRESSURE GAGES:

- A. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
- B. Type: General use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection. On coils, chillers and where indicated, provide differential pressure gages with two taps. Refer to details on the drawings for specific requirements.+
- C. Case: Drawn steel or brass, glass lens, 4-1/2" diameter.
- D. Connector: Brass with 1/4" male NPT.
- E. Scale: White coated aluminum, with permanently etched markings.

- F. Range: Conform to the following:
 - 1. Pumps: 0 - 100 psi.
- G. Manufacturer: Subject to compliance with requirements, provide pressure gages of one of the following or approved equivalent:
 - 1. Ametek/U.S. Gauge.
 - 2. Marsh Instrument Co.; Unit of General Signal.
 - 3. Marshalltown Instruments, Inc.
 - 4. Trerice (H.O.) Co.
 - 5. Weiss Instruments, Inc.
 - 6. Miljoco

2.5 PRESSURE GAGE COCKS:

- A. General: Provide pressure gage cocks between pressure gages and gage tees on piping systems. Construct gage cock of brass with 1/4" female NPT on each end, and "T" handle brass plug.
- B. Siphon: 1/4" straight coil constructed of brass tubing with 1/4" male NPT on each end.
- C. Snubber: 1/4" brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
- D. Manufacturer: Same as for pressure gages.

2.6 PRESSURE GAGE CONNECTOR PLUGS:

- A. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200°F (93°C). Construct of brass and finish in nickel-plate equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.
- B. Manufacturer: Subject to compliance with requirements, provide pressure gage connector plugs of one of the following or approved equivalent:
 - 1. Peterson Equipment Co.

2.7 WAFER-TYPE FLOW METERS:

- A. General: Provide as indicated, cast-iron wafer-type flow meters equipped with readout valves to facilitate connecting of differential pressure meter to flow meter. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures.
- B. Manufacturer: Subject to compliance with requirements, provide wafer-type flow meters of one of the following or approved equivalent:
 - 1. Bell & Gossett ITT; Fluid Handling Div.

2.8 CALIBRATED BALANCE VALVES:

- A. General: Provide as indicated, calibrated globe type balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Provide calibrated nameplate to indicated degree of closure of precision machined orifice. Construct balancing valve with internal EPT O-ring seals to prevent leakage around rotating element. Provide balance valves with preformed polyurethane insulation suitable for use on heating and cooling systems, and to protect balance valves during shipment.
- B. Manufacturer: Subject to compliance with requirements, provide calibrated balance valves of one of the following or approved equivalent:
 - 1. Armstrong

2. Griswold
3. MACON

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which meters and gages are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF TEMPERATURE GAGES:

- A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.
- B. Locations: Install as indicated on the drawings.
- C. Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Fill well with oil or graphite, secure cap.
- D. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.3 INSTALLATION OF PRESSURE GAGES:

- A. General: Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position.
- B. Locations: Install in the following locations, and elsewhere as indicated:
 1. At suction and discharge of each pump.
 2. At discharge of each pressure reducing valve.
- C. Pressure Gage Cocks: Install in piping tee with snubber. Install siphon for steam pressure gages.
- D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.4 INSTALLATION OF FLOW MEASURING METERS:

- A. General: Install flow measuring meters on piping systems located in accessible locations at most readable position.
- B. Locations: Install in the following locations, and elsewhere as indicated.
 1. At discharge of each pump.
- C. Wafer-Type Flow Meters: Install between 2 Class 125 pipe flanges, ANSI B16.1 (cast-iron) or ANSI B16.24 (cast-bronze). Provide minimum straight lengths of pipe upstream and downstream from meter in accordance with manufacturer's installation instructions.
- D. Calibrated Balance Valves: Install on piping with readout valves in vertical upright position. Maintain minimum length of straight unrestricted piping equivalent to 3 pipe diameters upstream of valve.

3.5 ADJUSTING AND CLEANING:

- A. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.
- B. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION 22 05 19

SECTION 22 05 23 - PLUMBING VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of valves specified in this section include the following:
 - 1. Gate Valves.
 - 2. Drain Valves.
 - 3. Ball Valves.
 - 4. Butterfly Valves.
 - 5. Swing Check Valves.
- C. Valves furnished as part of factory-fabricated equipment, are specified as part of equipment in other Division 22 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Valve Types: Provide valves of same type by same manufacturer.
- C. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.
- D. Codes and Standards:
- E. MSS Compliance: Mark valves in accordance with MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".
- F. ANSI Compliance: For face-to-face and end-to-end dimensions of flanged- or welded-end valve bodies, comply with ANSI B16.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
- B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 VALVES:

- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which

properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

- B. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
- C. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller.

2.2 GATE VALVES:

- A. Comply with the following standards:
 - 1. Cast-Iron Valves: MSS SP-70.
 - 2. Bronze Valves: MSS SP-80.
 - 3. Steel Valves: ANSI B16.34.
- B. Manufacturer: Subject to compliance with requirements, provide gate valves of one of the following or approved equivalent:
 - 1. Crane Co.
 - 2. Fairbanks Co.
 - 3. Hammond Valve Corp.
 - 4. ITT Grinnell Valve Co., Inc.
 - 5. Jenkins Bros.
 - 6. Lunkenheimer Co.
 - 7. Milwaukee Valve Co., Inc.
 - 8. Nibco, Inc.
 - 9. Powell (Wm) Co.
 - 10. Stockham Valves and Fittings.
 - 11. Walworth Co.

2.3 DRAIN VALVES:

- A. Comply with the following standards:
 - 1. Water Heater Drain Valves: ASSE 1005.
- B. Manufacturer: Subject to compliance with requirements, provide globe valves of one of the following or approved equivalent:
 - 1. Hammond Valve Corp.
 - 2. Lee Brothers; Div. Phelps Dodge Brass Co.
 - 3. Mansfield Plumbing Products.
 - 4. Nibco Inc.
 - 5. Prier Brass Mfg. Co.
 - 6. Tanner Mfg. Co.

2.4 BALL VALVES:

- A. Comply with the following standards:
 - 1. Bronze Valves: MSS SP-110.
- B. Manufacturer: Subject to compliance with requirements, provide ball valves of one of the following or approved equivalent:
 - 1. Conbraco Industries, Inc.
 - 2. Crane Co.
 - 3. Fairbanks Co.
 - 4. Hammond Valve Corp.

5. ITT Grinnell Valve Co., Inc.
6. Jamesbury Corp.
7. Jenkins Bros.
8. Metraflex Co.
9. Nibco, Inc.
10. Powell (The Wm.) Co.
11. Stockham Valves and Fittings, Inc.
12. Walworth Co.
13. Watts Regulator Co.

2.5 BUTTERFLY VALVES:

- A. General: Comply with MSS SP-67. Provide lug-body type valves for all applications.
- B. Manufacturer: Subject to compliance with requirements, provide butterfly valves of one of the following or approved equivalent:
 1. Center Line; Mark Controls Corp.
 2. Crane Co.
 3. Demco; Div. Cooper Industries, Inc.
 4. Fairbanks Co.
 5. ITT Grinnell Valve Co., Inc.
 6. Jamesbury Corp.
 7. Jenkins Bros.
 8. Keystone Valve USA.
 9. Nibco, Inc.
 10. Powell (The Wm.) Co.
 11. Stockham Valves and Fittings.

2.6 SWING CHECK VALVES:

- A. Comply with the following standards:
 1. Cast-Iron Valves: MSS SP-71.
 2. Bronze Valves: MSS SP-80
 3. Steel Valves: ANSI B16.34.
- B. Manufacturer: Subject to compliance with requirements, provide swing check valves of one of the following or approved equivalent:
 1. Crane Co.
 2. Fairbanks Co.
 3. Hammond Valve Corp.
 4. Jenkins Bros.
 5. Lunkenheimer Co.
 6. Milwaukee Valve Co., Inc.
 7. Nibco, Inc.
 8. Powell (The Wm.) Co.
 9. Stockham Valves and Fittings
 10. TITAN
 11. Walworth Co.

2.7 VALVE FEATURES:

- A. General: Provide valves with features indicated and, where not indicated otherwise, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
- B. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).
- C. Threaded: Valve ends complying with ANSI B2.1.
- D. Socket-Welding: Valve ends complying with ANSI B16.11.
- E. Solder-Joint: Valve ends comply with ANSI B16.18.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Except as otherwise indicated, comply with the following requirements:
 - 1. Install valve where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 - 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Mechanical Actuators: Install mechanical actuators with chain operators where indicated. Extend chains to about 5' above floor and hook to clips to clear aisle passage.
- D. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
 - 1. Tube Size 2" and Smaller: Soldered-joint valves.
 - 2. Pipe Size 2" and Smaller: One of the following, at Installer's option:
 - a. Threaded valves.
 - b. Butt-welding valves
 - c. Socket-welding valves.
 - d. Flanged valves.
 - 3. Pipe Size 2 1/2" and Larger: One of the following, at Installer's option.
 - a. Grooved-end valves.
 - b. Butt-welding valves.
 - c. Socket-welding valves.
 - d. Flanged valves.
- E. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- F. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- G. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- H. Fluid Control: Except as otherwise indicated, install gate, ball, and butterfly valves to comply with ANSI B31.9. Where throttling is indicated or recognized as principal reason for valve, install butterfly valves, unless indicated otherwise on the plans.

3.2 INSTALLATION OF CHECK VALVES:

- A. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

3.3 ADJUSTING AND CLEANING:

- A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- B. Valve Identification: Tag each valve in accordance with Division 22 section "Mechanical Identification".
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.4 VALVE SCHEDULE:

- A. General: Provide the following valves for various valve types listed in Division 22 piping sections.

3.5 GATE VALVES:

- A. 2" and Smaller: Class 125, bronze, screw-in bonnet, rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	428	1334
Fairbanks:	0252	0282
Grinnell:	3010	3010-SJ
Hammond:	IB640	IB635
Jenkins:	47	1242
Lunkenheimer:	2127	2132
Milwaukee:	148	1149
Nibco:	T-111	S-111
Powell:	500-S	1821-S
Stockham:	B-100	B-108
Walworth:	55	55-SJ

- C. 2" and Smaller: Class 125, bronze, screw-in bonnet, non-rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	438	1324
Fairbanks:	0250	0280
Grinnell:	3000	3000-SJ
Hammond:	IB645	IB647
Jenkins:	370	1240
Lunkenheimer:	2129	2133
Milwaukee:	105	1145
Nibco:	T-113	S-113
Powell:	507	1822
Stockham:	B-103	B-104
Walworth:	55	4-SJ

- D. 2 1/2" and Larger: Flanged ends, class 125, iron body, bolted bonnet, solid wedge, bronze mounted.

	OS&Y	Non-Rising Stem
Crane:	4651/2	461
Fairbanks:	0405	0403
Grinnell:	6020	6060
Hammond:	IR1140	IR1138
Jenkins:	651A	326
Lunkenheimer:	1430	1428
Milwaukee:	F-2885	F-2882
Nibco:	617-O	F-619
Powell:	1793	1787
Stockham:	G0623	G-612
Walworth:	8726-F	8719-F

- E. Hose End, 2 1/2": FM, 174 psi, bronze body, solid wedge, inside screw, non-rising stem. Provide cap and chain.

Fairbanks:	0210.
Jenkins:	707.
Lunkenheimer:	366.
Nibco:	T-103-HC.
Walworth:	115.

- F. Threaded End; 2" and Smaller: FM, UL-listed, 175 psi, bronze body, solid wedge, outside screw and yoke, rising stem.

Crane:	459.
Fairbanks:	0222.
Hammond:	IB681.
Jenkins:	175U.
Nibco:	T-104-O.
Stockham:	B-133.
Walworth:	904.

- G. Flanged End; 2 1/2" and Larger: FM, UL-Listed, 175 psi, iron body bronze mounted, solid wedge, outside screw and yoke, rising stem.

Crane:	467.
Fairbanks:	0412.
Hammond:	IR1154.
Jenkins:	825-A.
Nibco:	F-607-O.
Stockham:	G-634.
Walworth:	8713-F.

3.6 DRAIN VALVES:

- A. Class 125: Bronze body, screw-in bonnet, rising stem, composition disc, 3/4" hose outlet.

	Threaded Ends	Solder Ends
Hammond:	712	711
Lee:	717-20	717-12
Mansfield:	526.40	526.41
Nibco:	73	72
Prier:	C-73ST	C-71ST
Tanner:	806	851

3.7 BALL VALVES:

- A. 1" and Smaller: 150 psi, bronze body, standard port, bronze trim, 2-piece construction, TFE seats and seals.

	Threaded Ends	Solder Ends
Conbraco:	70	70
Crane:	2182	2182
Grinnell:	3700	3700-SJ
Jamesbury:	21-1100	-
Jenkins:	900T	902T
Metraflex:	IT	IS
Nibco:	T-585	S-585
Powell:	4520R20	421OR
Stockham:	S-216BRRT	S-216BRRS
Watts:	B-6000	B-6001

- A. 1 1/4" to 2": 150 psi, bronze body, standard port, 3-piece body, TFE seats with bronze trim.

	Threaded Ends	Solder Ends
Conbraco:	82	82
Fairbanks:	0851	-
Nibco:	T-595-Y	S-959-Y
Powell:	4201-R	4201-R
Watts:	B-6800	B-6801

3.8 BUTTERFLY VALVES:

- A. 6" and Smaller: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, manual lever and lock.

	Lug
CenterLine:	SeriesLT
Crane:	14
Demco:	SeriesCE
Fairbanks:	3502
Grinnell:	WC-LC-8211
Hammond:	33824
Jamesbury:	8815L
Keystone:	10
Nibco:	WL-NL-082-3
Powell:	Series5000
Stockham:	LD-711-BS3E
Grooved Ends:	Victaulic Series 700.

- B. 8" and Larger: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, gear operator.

	Lug
CenterLine:	SeriesLT
Crane:	14
Demco:	SeriesCE
Fairbanks:	602
Grinnell:	LC-8212
Keystone:	122
Nibco:	NL-082-5
Powell:	Series5000
Stockham:	LD-721-BS3E
Grooved Ends:	Victaulic Series 701.

3.9 SWING CHECK VALVES:

- A. 2" and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc.

	Threaded Ends	Solder Ends
Crane:	37	1342
Fairbanks:	0640	0680
Grinnell:	3300	3300-SJ
Jenkins:	92-A	1222
Lunkenheimer:	2144	2145
Milwaukee:	509	1509
Nibco:	T-413	S-413
Powell:	578	1825
Stockham:	B-319	B-309
Walworth:	340600	3406-SJ

- B. 2 1/2" and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends.

Crane:	373.
Fairbanks:	0702.
Grinnell:	6300.
Hammond:	IE1124.
Jenkins:	624.
Lunkenheimer:	1790.
Milwaukee:	F2971.
Nibco:	F-918.
Powell:	559.
Stockham:	G-931.
Walworth:	8928-F.

- C. 2 1/2" and Larger; FM: 175 psi, iron body bronze mounted, renewable composition disc and bronze seat ring, bolted cover, flanged ends.

Fairbanks:	0711.
Jenkins:	729.
Nibco:	F-908-W.
Stockham:	G-940.
Walworth:	8883-LT.

END OF SECTION 22 05 23

SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of supports and anchors specified in this section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Hanger-Rod Attachments.
 - 3. Building Attachments.
 - 4. Saddles and Shields.
 - 5. Miscellaneous Materials.
 - 6. Anchors.
 - 7. Equipment Supports.
- C. Supports and anchors furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 22 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. Code Compliance: Comply with Florida Building Code pertaining to product materials and installation of supports and anchors.
 - 2. UL and FM Compliance: Provide products which are UL-listed and FM approved.
 - 3. MSS Standard Compliance:
 - a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
 - b. Select and apply pipe hangers and supports, complying with MSS SP-69.
 - c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - d. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 HORIZONTAL-PIPING HANGERS AND SUPPORTS:

- A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to

suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

- B. Adjustable Steel Clevis Hangers: MSS Type 1.
- C. Steel Double Bolt Pipe Clamps: MSS Type 3.
- D. Steel Pipe Clamps: MSS Type 4.
- E. Pipe Hangers: MSS Type 5.
- F. Split Pipe Rings: MSS Type 11.
- G. Clips: MSS Type 26.
- H. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
- I. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base-support and cast-iron floor flange.

2.2 HANGER ROD ATTACHMENTS:

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
- B. Steel Turnbuckles: MSS Type 13.

2.3 BUILDING ATTACHMENTS:

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- B. Concrete Inserts: MSS Type 18.
- C. Top Beam C-Clamps: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Steel Brackets: One of the following for indicated loading:
 - 1. Light Duty: MSS Type 31.
 - 2. Medium Duty: MSS Type 32.
 - 3. Heavy Duty: MSS Type 33.

2.4 SADDLES AND SHIELDS:

- A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D. Thermal Hanger Shields: Constructed of 360° insert of high density, 100 psi, water-proofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.

- E. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following or approved equivalent:
 - 1. Elcen Metal Products Co.
 - 2. Pipe Shields, Inc.

2.5 MANUFACTURERS OF HANGERS AND SUPPORTS:

- A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following or approved equivalent:
 - 1. B-Line Systems, Inc.
 - 2. Carpenter and Patterson, Inc.
 - 3. Corner & Lada Co., Inc.
 - 4. Elcen Metal Products Co.
 - 5. Fee & Mason Mfg. Co.; Div. Figgie International.
 - 6. ITT Grinnel Corp.

2.6 MISCELLANEOUS MATERIALS:

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.
- C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION:

- A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct the inadequacies, including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS:

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install any additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.4 INSTALLATION OF HANGERS AND SUPPORTS:

- A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- D. Provisions for movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
- G. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - 2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
 - 3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.5 INSTALLATION OF ANCHORS:

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.6 EQUIPMENT SUPPORTS:

- A. Provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 22. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

3.7 ADJUSTING AND CLEANING:

- A. Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments.
- B. Supports Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 22 05 29

SECTION 22 05 48 - PLUMBING PIPING AND EQUIPMENT NOISE AND VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Noise criteria, vibration tolerance, and vibration isolation for HVAC and plumbing work.

1.3 QUALITY ASSURANCE

- A. Refer to section, "QUALITY ASSURANCE" in specification 22 00 10.
- B. Noise Criteria:
 - 1. Noise levels in all 8 octave bands due to equipment and duct systems shall not exceed the following values. The stated NC levels are "raw" NC levels and do not include room effect. Manufacturer's product data which includes a room attenuation or room effect are not acceptable and must be increased by the room effect.
 - 2. For equipment which has no sound power ratings scheduled on the plans, the contractor shall select equipment such that the foregoing noise criteria, local ordinance noise levels, and OSHA requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE 2015 Applications Handbook, Chapter 48, NOISE AND VIBRATION CONTROL. An average value of 10 dB shall be used as the room attenuating effect, i.e., the difference between sound power level emitted to room and sound pressure level in room.
 - 3. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.
 - 4. Comply with other requirements in these contract documents for sound and noise control, including requirements on the architectural drawings and Specifications.
- C. Allowable Vibration Tolerances for Rotating, Non-reciprocating Equipment: Not to exceed a self-excited vibration maximum velocity of 0.20-inch per second RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.

1.4 SUBMITTALS

- A. Submit in accordance with specification 15000:
- B. Manufacturer's Literature and Data:
 - 1. Vibration isolators:
 - a. Floor mountings.
 - b. Hangers.
 - c. Snubbers.
 - d. Thrust restraints.
 - 2. Bases.
 - 3. Acoustical enclosures.
- C. Isolator: manufacturer shall furnish with submittal load calculations for selection of isolators, including supplemental bases, based on lowest operating speed of equipment supported.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 - 1. HVAC Applications Handbook 2003, Chapter 47, Sound and Vibration Control.
- C. American Society for Testing and Materials (ASTM):
 - 1. A123-89 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. A307-90 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 3. D2240-86 Rubber Property - Durometer Hardness
- D. Manufacturers Standardization (MSS):
 - 1. SP-58-88 Pipe Hangers and supports-Materials, Design and Manufacture
- E. Occupational Safety and Health Administration (OSHA):
 - 1. Occupational Noise Exposure

PART 2 - PRODUCTS

2.1 GENERAL

- A. Type of sound attenuator, isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated in the schedule on the drawings.
- B. Group 1: Acoustically Sensitive Spaces NC 40
 - 1. Media Rooms
- C. Group 3: Typical Areas NC 45
 - 1. Administrative Offices, Classrooms.

2.2 VIBRATION ISOLATORS

- A. Floor Mountings:
 - 1. Double Deflection Neoprene (Type N): Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes.
 - 2. Spring Isolators (Type S): Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.
 - 3. Spring Isolators with Vertical Limit Stops (Type SP): Similar to spring isolators preceding, except include a vertical limit stop to limit upward travel if weight is removed and also to reduce movement due to wind loads. Provide clearance around restraining bolts to prevent mechanical short circuiting.
 - 4. Pads (Type D), Washers (Type W), and Bushings (Type L): Pads shall be felt, cork, neoprene waffle, neoprene and cork sandwich, neoprene and fiberglass, neoprene and steel waffle, or reinforced duck and neoprene. Washers and bushings shall be reinforced duck and neoprene. Size pads for a maximum load of 50 pounds per square inch.
- B. Hangers: Shall be combination neoprene and springs unless otherwise noted and shall allow for expansion of pipe.
 - 1. Combination Neoprene and Spring (Type H): Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.

2. Spring Position Hanger (Type HP): Similar to combination neoprene and spring hanger except hanger shall hold piping at a fixed elevation during installation and include a secondary adjustment feature to transfer load to spring while maintaining same position.
 3. Neoprene (Type HN): Vibration hanger shall contain a double deflection type neoprene isolation element. Hanger rod shall be separated from contact with hanger bracket by a neoprene grommet.
 4. Spring (Type HS): Vibration hanger shall contain a coiled steel spring in series with a neoprene grommet. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
 5. Hanger supports for piping 2-inches and larger shall have a pointer and scale deflection indicator.
- C. Snubbers: Each spring mounted base shall have a minimum of four all-directional or eight two directional (two per side) seismic snubbers that are double acting. Elastomeric materials shall be shock absorbent neoprene bridge quality bearing pads, maximum 60 durometer, replaceable and have a minimum thickness of 1/4-inch. Air gap between hard and resilient material shall be not less than 1/8-inch nor more than 1/4-inch. Restraints shall be capable of withstanding design load without permanent deformation.
- D. Thrust Restraints (Type THR): Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow 1/4-inch maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.
- E. Manufacturer: Subject to compliance with requirements, provide vibration isolators of one of the following or approved equivalent:
1. Mason Industries
 2. Vibration Eliminator Co., Inc.

2.3 BASES

- A. Rails (Type R): Design rails with isolator brackets to reduce mounting height of equipment and cradle machines having legs or bases that do not require a complete supplementary base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension but not less than four-inches. Where rails are used with neoprene mounts for small fans or close coupled pumps, extend rails to compensate overhang of housing.
- B. Integral Structural Steel Base (Type B): Design base with isolator brackets to reduce mounting height of equipment which require a complete supplementary rigid base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension, but not less than four-inches.
- C. Inertia Base (Type I): Base shall be a reinforced concrete inertia base. Pour concrete into a welded steel channel frame, incorporating pre-located equipment anchor bolts and pipe sleeves. Level concrete to provide a smooth uniform bearing surface for equipment mounting. Provide grout under uneven supports. Channel depth shall be a minimum of 1/12 of longest dimension of base but not less than six inches. Form shall include 1/2-inch reinforcing bars welded in place on minimum of eight inch centers running both ways in a layer 1-1/2 inches above bottom. Use height saving brackets in all mounting locations. Weight of inertia base shall be equal to or greater than weight of equipment supported to provide a maximum peak-to-peak displacement of 1/16-inch.

2.4 GENERAL ISOLATOR REQUIREMENTS:

- A. Elastomeric isolators shall comply with ASTM D2240 and be oil resistant neoprene with a maximum stiffness of 60 durometer and have a straight-line deflection curve.
- B. Exposure to Weather: Isolators, including springs, exposed to weather shall be hot-dip galvanized after fabrication. Hot-dip zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

- C. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.
- D. Color code isolator by type and size for easy identification of capacity.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Vibration Isolation:
 - 1. No metal-to-metal contact will be permitted between fixed and floating parts.
 - 2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, (etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.
 - 3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling, and bolting.
 - 4. Provide heat shields where elastomers are subject to temperatures over 100 degrees F.
 - 5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.
 - 6. Non-rotating equipment such as heat exchangers and converters shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.
- B. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.

END OF SECTION 22 05 48

SECTION 22 05 53 - PLUMBING PIPING AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of identification devices specified in this section include the following:
 - 1. Painted Identification Materials.
 - 2. Plastic Pipe Markers.
 - 3. Plastic Tape.
 - 4. Valve Tags.
 - 5. Engraved Plastic-Laminate Signs.
 - 6. Plastic Equipment Markers.
 - 7. Plasticized Tags.
- C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of equipment assembly in other Division 22 sections.
- D. Refer to Division 26 sections for identification requirements of electrical work; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following or approved equivalent:
 - 1. Allen Systems, Inc.
 - 2. Brady (W.H.) Co.; Signmark Div.
 - 3. Industrial Safety Supply Co., Inc.
 - 4. Seton Name Plate Corp.

2.2 MECHANICAL IDENTIFICATION MATERIALS:

- A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 22 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.3 PAINTED IDENTIFICATION MATERIALS:

- A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for duct work and not less than 3/4" high letters for access door signs and similar operational instructions.
- B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
- C. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

2.4 PLASTIC PIPE MARKERS:

- A. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.
- B. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125oF (52oC) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
- C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - 1. Adhesive lap joint in pipe marker overlap.
 - 2. Laminated or bonded application of pipe marker to pipe (or insulation).
 - 3. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
- D. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.
- E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.5 PLASTIC TAPE:

- A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
- B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.
- C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.6 VALVE TAGS:

- A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
 - 1. Provide 1-1/2" diameter tags.
 - 2. Fill tag engraving with black enamel.
- B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- C. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.7 ENGRAVED PLASTIC-LAMINATE SIGNS:

- A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

- B. Thickness: 1/8".
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.8 PLASTIC EQUIPMENT MARKERS:

- A. General: Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code:
 - 1. Green: Cooling equipment and components.
 - 2. Yellow/Green: Combination cooling and heating equipment and components.
 - 3. Blue: Equipment and components that do not meet any of the above criteria.
- B. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - 1. Name and plan number.
 - 2. Equipment service.
 - 3. Design capacity.
 - 4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.
- C. Size: Provide approximate 2-1/2" x 4" markers for control devices, dampers, and valves; and 4-1/2" x 6" for equipment.

2.9 PLASTICIZED TAGS:

- A. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

2.10 LETTERING AND GRAPHICS:

- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS:

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 PIPING SYSTEM IDENTIFICATION:

- A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
 - 1. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2" beyond ends of lettering.
 - 2. Stenciled markers, with lettering color complying with ANSI A13.1.
 - 3. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot non-insulated pipes.
 - 4. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.
- B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - 1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
4. At access doors, manholes, and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3 VALVE IDENTIFICATION:

- A. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures, and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
- B. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
 1. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

3.4 EQUIPMENT IDENTIFICATION:

- A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
 1. Main control and operating valves.
 2. Meters, gages, thermometers, and similar units.
 3. Pumps, compressors, and similar motor-driven units.
- B. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.
- C. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
- D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- E. Optional Use of Plasticized Tags: At Installer's option, where equipment to be identified as concealed above acoustical ceiling or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).

3.5 ADJUSTING AND CLEANING:

- A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
- B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 22 05 53

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping System Insulation:
 - a. Fiberglass
 - b. Cellular Glass.
 - c. Flexible Unicellular.
 - 2. Equipment Insulation:
 - a. Cellular Glass.
- C. Refer to Division 22 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D. Refer to Division 22 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
- D. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following or approved equivalent:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. Knauf Fiber Glass GmbH.
 - 4. Manville Products Corp.
 - 5. Owens-Corning Fiberglas Corp.
 - 6. Pittsburgh Corning Corp.
 - 7. Rubatex Corp.

2.2 PIPING INSULATION MATERIALS:

- A. Fiberglass Piping Insulation: ASTM C 547, Class 1.
- B. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2.
- C. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.
- D. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installer's option.
- E. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
- F. Encase exterior piping insulation and piping insulation in mechanical rooms up to 6 feet above the floor with aluminum jacket. Aluminum jackets shall cover all fittings and valves for 100% coverage. PVC fitting covers are not permissible.
- G. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- H. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- I. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L, or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.3 EQUIPMENT INSULATION MATERIALS:

- A. Cellular Glass Equipment Insulation: ASTM C 552, Type I.
- B. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
- C. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L, or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Use adhesives and sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- D. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PLUMBING PIPING SYSTEM INSULATION:

- A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
- B. Hot Piping:
 1. Application Requirements: Insulate the following hot plumbing piping systems:
 - a. Potable hot water piping.
 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
 - a. Fiberglass: 1" thick for pipe sizes up to and including 6".

3.3 EQUIPMENT INSULATION:

- A. Cold Equipment (Below Ambient Temperature):
 1. Application Requirements: Insulate the following cold equipment:
 - a. Cold equipment, including chillers, tanks, valve bodies, strainers and pumps.
 - b. Drip pans under chilled equipment.
 - c. Cold and chilled water pumps.
 - d. Roof drain bodies.
 2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
 - a. Cellular Glass: 3" thick for surfaces above 35°F (2°C) and 4- 1/2" thick for surfaces 35°F (2°C) and lower (cold and chilled water pumps, expansion tanks, and air and solids separators).
 - b. Flexible Unicellular: 1" thick (roof drain bodies and drip pans).

3.4 INSTALLATION OF PIPING INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings, and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- G. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise indicated.
- H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.5 INSTALLATION OF EQUIPMENT INSULATION:

- A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
- C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
- D. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- E. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
- F. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
- G. Do not insulate handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.
- H. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.
- I. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by manufacturer.

3.6 PROTECTION AND REPLACEMENT:

- A. Replace damaged insulation which cannot be satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 22 07 00

SECTION 22 11 13 - POTABLE WATER SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.
- B. Insulation for potable water piping is specified in other Division 22 sections, and is included as work of this section.
- C. Refer to other Division 22 sections for plumbing equipment; not work of this section.
- D. Refer to other Division 22 sections for plumbing fixtures; not work of this section.
- E. Trenching and backfill required in conjunction with exterior water piping is specified in other applicable specification sections, and is included as work of this section.
- F. Trenching and backfill required in conjunction with potable water piping inside of building foundations is specified in other specification sections, and is included as work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with potable water systems work similar to that required for project.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of Florida Building Code – Plumbing pertaining to selection and installation of plumbing materials and products.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for potable water systems materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed potable water systems piping and piping products, in accordance with requirements of Division 00.
- C. Maintenance Data: Submit maintenance data and parts lists for potable water systems materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Building Code – Plumbing where applicable. Provide sizes and types

matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:

- A. General: Provide identification complying with Division 22 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
 - 1. Potable Water Piping: Plastic pipe markers.
 - 2. Water Service: Underground-type plastic line markers.

2.3 BASIC PIPES AND PIPE FITTINGS:

- A. General: Provide pipes and pipe fittings complying with Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Interior Water Piping:
 - 1. Above Ground: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.
 - 2. Below Ground: Copper tube; Type k, soft annealed; wrought-copper fittings, solder-joints.
- C. Exterior Water Piping:
 - 1. Pipe Size 3" and Smaller: Polyvinyl chloride pipe (PVC), Schedule 40; PVC socket fittings, solvent cement joints.
 - 2. Pipe Size 4" through 12": Polyvinyl chloride (PVC) water pipe; Class 100; cast-iron or ductile-iron fittings, mechanical joints.

2.4 BASIC PIPING SPECIALTIES:

- A. General: Provide piping specialties complying with Division 22 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
 - 1. Pipe escutcheons.
 - 2. Dielectric unions.
 - 3. Mechanical sleeve seals.
 - 4. Water hammer arresters.
 - 5. Pipe sleeves.
 - 6. Sleeve seals.
- B. Manufacturer: Subject to compliance with requirements, provide basket strainers of one of the following or approved equivalent:
 - 1. Josam Mfg. Co.
 - 2. Metraflex Co.
 - 3. Spirax Sarco.
 - 4. Smith (Jay R.) Mfg. Co.

2.5 BASIC SUPPORTS AND ANCHORS:

- A. General: Provide supports and anchors complying with Division 22 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
 - 1. Adjustable steel clevises and adjustable pipe saddle supports for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical piping supports.
 - 3. Concrete inserts, C-clamps, and steel brackets for building attachments.
 - 4. Protection shields for insulated piping support in hangers.

2.6 BASIC VALVES:

- A. General: Provide valves complying with Division 22 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:
- B. Sectional Valves:
 - 1. 2" and Smaller: Gate valves or ball valves.
 - 2. 2" and Larger: Gate valves.
- C. Shutoff Valves:
 - 1. 2" and Smaller: Gate valves or ball valves.
 - 2. 2-1/2" and Larger: Gate valves.
- D. Drain Valves:
 - 1. 2" and Smaller: Gate valves or ball valves.
 - 2. 2-1/2" and Larger: Gate valves.
- E. Check Valves:
 - 1. All Sizes: Swing check valves

2.7 BALANCE COCKS:

- A. Threaded Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight, or angle pattern.
- B. Soldered Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight or angle pattern.
- C. Manufacturer: Subject to compliance with requirements, provide balance cocks of one of the following or approved equivalent:
 - 1. American Air Filter Co.
 - 2. Bell & Gossett ITT; Fluid Handling Div.
 - 3. Hammond Valve Corp.
 - 4. Milwaukee Valve Co., Inc.
 - 5. Spirax Sarco.
 - 6. Taco, Inc.

2.8 BIBBS AND FAUCETS:

- A. Hose Bibbs:
 - 1. Threaded End: Bronze body, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet.
- B. Sill Faucets:
 - 1. Threaded End: Bronze body, renewable composition disc, wheel handle, 3/4" NPT inlet, 3/4" hose outlet.
 - 2. Soldered End: Bronze body, renewable composition disc, wheel handle, 3/4" solder inlet, 3/4" hose outlet.
- C. Manufacturer: Subject to compliance with requirements, provide bibbs and faucets of one of the following or approved equivalent:
 - 1. Hammond Valve Corp.
 - 2. Lee Brothers; Div. Phelps Dodge Brass Co.
 - 3. Mansfield Plumbing Products.
 - 4. Nibco Inc.
 - 5. Prier Brass Mfg. Co.
 - 6. Tanner Mfg. Co.

7. Watts Regulator Co.

2.9 HYDRANTS:

- A. Recessed Wall Hydrants: Cast-bronze box hydrant, chrome plated face, tee handle key, bronze casing, length to suit wall thickness, vacuum breaker, hinged locking cover, 3/4" inlet, hose outlet.
- B. Manufacturer: Subject to compliance with requirements, provide hydrants of one of the following or approved equivalent:
 - 1. Josam Mfg. Co.
 - 2. Smith, (Jay R.) Mfg. Co.
 - 3. Tyler Pipe; Sub. of Tyler Corp.
 - 4. Woodford Mfg. Co.
 - 5. Zurn Industries Inc, Hydromechanics Div.

2.10 BACKFLOW PREVENTERS:

- A. General: Provide reduced pressure principle backflow preventers consisting of assembly including shutoff valves on inlet and outlet, and strainer on inlet. Backflow preventers shall include test cocks, and pressure-differential relief valve located between 2 positive seating check valves. Construct in accordance with ASSE Standard 1013.
- B. Manufacturer: Subject to compliance with requirements, provide backflow preventers of one of the following or approved equivalent:
 - 1. Febco Sales, Inc.; Subs. of Charles M. Bailey Co., Inc.
 - 2. Hersey Products, Inc.
 - 3. ITT Lawler; Fluid Handling Div.
 - 4. Watts Regulator Co.

2.11 PRESSURE REGULATING VALVES:

- A. General: Provide pressure regulating valves, single seated, direct operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003. Size for maximum flow rate and inlet and outlet pressures indicated on drawings.
- B. Manufacturer: Subject to compliance with requirements, provide pressure regulating valves of one of the following or approved equivalent:
 - 1. Cash (A.W.) Valve Mfr. Corp.
 - 2. Cla-Val Co.
 - 3. Spence Engineering Co., Inc.
 - 4. Watts Regulator Co.

2.12 RELIEF VALVES:

- A. General: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
- B. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F (99°C), and pressure relief at 150 psi.
- C. Manufacturer: Subject to compliance with requirements, provide relief valves of one of the following or approved equivalent:
 - 1. Cash (A.W.) Valve Mfg. Corp.
 - 2. Conbraco Industries, Inc.
 - 3. Watts Regulator Co.
 - 4. Zurn Industries, Inc.; Wilkins-Regulator Div.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:

- A. General: Install mechanical identification in accordance with Division 22 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF POTABLE WATER DISTRIBUTION PIPING:

- A. General: Install water distribution piping in accordance with Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
- C. Install piping level with no pitch.
- D. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 INSTALLATION OF EXTERIOR WATER PIPING:

- A. General: Install exterior water service piping system in compliance with local governing regulations.
- B. Water Service Piping: Extend water service piping of size and in location indicated to water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry watertight. Provide shutoff valve at water service entry inside building; strainer, pressure gage, test tee with valve.
- C. PVC: Install in accordance with manufacturers recommendations.

3.5 INSTALLATION OF PIPING SPECIALTIES:

- A. Install piping specialties in accordance with Division 22 Basic Mechanical Materials and Methods section "Piping Specialties".

3.6 INSTALLATION OF SUPPORTS AND ANCHORS:

- A. Install supports and anchors in accordance with Division 22 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.7 INSTALLATION OF VALVES:

- A. Install valves in accordance with Division 22 Basic Mechanical Materials and Methods section "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.
- E. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
- F. Balance Cocks: Install in each hot water recirculating loop, and elsewhere as indicated.
- G. Hose Bibbs: Install on exposed piping where indicated, with vacuum breaker.

- H. Sill Faucets: Install where indicated with vacuum breaker.
- I. Hydrants: Install where indicated, in accordance with manufacturer's installation instructions.

3.8 INSTALLATION OF BACKFLOW PREVENTERS:

- A. Install backflow preventers where indicated, and where required by Florida Building Code – Plumbing. Locate in same room as equipment being protected. Pipe relief outlet to nearest floor drain.

3.9 INSTALLATION OF PRESSURE REGULATING VALVES:

- A. Install pressure regulating valves where indicated. Provide inlet and outlet shutoff valves, and throttling valve bypass. Provide pressure gage on valve outlet.

3.10 EQUIPMENT CONNECTIONS:

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Florida Building Code – Plumbing.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.

3.11 FIELD QUALITY CONTROL:

- A. Piping Tests: Test potable water piping in accordance with testing requirements of Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.12 ADJUSTING AND CLEANING:

- A. Cleaning, Flushing, and Inspecting: Clean, flush, and inspect potable water systems in accordance with requirements of Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Disinfection: Disinfect water service line in accordance with AWWA C601. Disinfect potable water system in accordance with Florida Building Code – Plumbing.

3.13 SPARE PARTS:

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

END OF SECTION 22 11 13

SECTION 22 11 16 - DOMESTIC WATER PIPING AND PIPE FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Type of pipes and pipe fittings specified in this section include the following:
 - 1. Steel Pipes.
 - 2. Copper Tube.
 - 3. Cast-Iron Soil Pipes.
 - 4. Plastic Pipes.
 - 5. Miscellaneous Piping Materials/Products.
- C. Pipes and pipe fittings furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 22 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

- A. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
 - 1. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).
- B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
- C. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

1.5 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.
- B. Welding Certifications: Submit reports as required for piping work.
- C. Brazing Certifications: Submit reports as required for piping work.
- D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 00.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.
- B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS:

- A. Black Steel Pipe: ASTM A53, A106 or A120; except comply with ASTM A53 or A106 where close coiling or bending is required.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3.
- C. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass).
- D. Threaded Pipe Plugs: ANSI B16.14.
- E. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
 - 1. Material Group: Group 1.1.
 - 2. End Connections: Buttwelding.
 - 3. Facings: Raised-face.
- F. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.
- G. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/2", and do not thread nipples full length (no close-nipples).

2.3 COPPER TUBE AND FITTINGS:

- A. Copper Tube: ASTM B88; type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.
- B. Cast-Copper Solder-Joint Fittings: ANSI B16.18.
- C. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
- D. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.
- E. Copper Pressure-Seal-Joint Fittings:
 - 1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.4 PLASTIC PIPES AND PIPE FITTINGS:

- A. Polyvinyl Chloride Pipe (PVC): ASTM D1785.
- B. Polyvinyl Chloride Drain, Waste, and Vent Pipe (PVC): ASTM D2665.
- C. Chlorinated Polyvinyl Chloride Pipe (CPVC): ASTM F441.
- D. PVC Fittings:
 - 1. Schedule 40 Socket: ASTM D2466.
 - 2. Schedule 80 Socket: ASTM D2467.
 - 3. Schedule 80 Threaded: ASTM D2464.
 - 4. DWV Socket: ASTM D2665.
 - 5. Sewer Socket: ASTM D2729.
 - 6. Solvent Cement: ASTM D2564.
 - 7. Solvent Cement (To Join PVC to ABS): ASTM D3138.

2.5 GROOVED PIPING PRODUCTS:

- A. General: As Installer's option, mechanical grooved pipe couplings and fittings may be used for piping systems in mechanical equipment rooms having operating conditions not exceeding 230°F (110°C), excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.
- B. Coupling Housings: Malleable iron conforming to ASTM A47 or ductile iron conforming to ASTM A536.
- C. Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.
- D. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D2000.
- E. Bolts and Nuts: Heat-treated carbon steel, ASTM A183, minimum tensile 110,000 psi.
- F. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.
- G. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.
- H. Malleable Iron: ASTM A47.
- I. Ductile Iron: ASTM A536.
- J. Fabricated Steel: ASTM A53, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20".
- K. Steel: ASTM A234.
- L. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt hole alignment.
- M. Malleable Iron: ASTM A47.
- N. Ductile Iron: ASTM A536.
- O. Grooves: Conform to the following:
 - 1. Standard Steel: Square cut.
- P. Manufacturer: Subject to compliance with requirements, provide grooved piping products of one of the following or approved equivalent:
 - 1. ITT Grinnell Corp.
 - 2. Stockham Valves & Fittings, Inc.
 - 3. Victaulic Co. of America.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:

- A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements.
- B. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
- C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements.
- D. Tin-Antimony Solder: ASTM B32, Grade 95TA.
- E. Gaskets for Flanged Joints: ANSI B16.21; full-faces for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.
- F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
- G. Manufacturer: Subject to compliance with requirements, provide piping connectors of the following or approved equivalent:
 - 1. Fernco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.
- B. Comply with ANSI B31 Code for Pressure Piping.
- C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- D. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures.

3.2 PIPING SYSTEM JOINTS:

- A. General: Provide joints of type indicated in each piping system.
- B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- C. Solder copper tube-and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- D. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.

- E. Weld pipe joints only when ambient temperature is above 0°F (-18°C) where possible.
- F. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
- G. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
- H. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
- I. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
- J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
- K. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.
- L. Making Solvent-Cemented Joints: ASTM D2235, and ASTM F402.
- M. Grooved Pipe Joints: Comply with fitting manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions.
- N. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

3.3 CLEANING, FLUSHING, INSPECTING:

- A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
- B. Inspect pressure piping in accordance with procedures of ASME B31.
- C. Disinfect water service piping in accordance with AWWA C601.

3.4 PIPING TESTS:

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
- C. Required test period is 48 hours.
- D. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.
- E. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- G. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of piping specialties work required by this section is indicated on drawings and schedules and by requirements of this section.
- B. Types of piping specialties specified in this section include the following:
 - 1. Pipe Escutcheons
 - 2. Pipeline Strainers
 - 3. Vandal-Proof Vent Caps
 - 4. Dielectric Unions
 - 5. Mechanical Sleeve Seals
 - 6. Fire Barrier Penetration Seals
 - 7. Water Hammer Arresters
 - 8. Drip Pans
 - 9. Pipe Sleeves
 - 10. Sleeve Seals
- C. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 22 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

- A. FCI Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1 "Pressure Rating Standard for "Y" Type Strainers". Test and rate other type strainers in accordance with FCI 78-1 "Pressure Rating Standard for Pipeline Strainers Other than "Y" Type".

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
- B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.
- C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not

indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 PIPE ESCUTCHEONS

- A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside the pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- D. Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following or approved equivalent:
 - 1. Chicago Specialty Mfg. Co.
 - 2. Producers Specialty & Mfg. Corp.
 - 3. Sanitary-Dash Mfg. Co.

2.3 LOW PRESSURE Y-TYPE PIPELINE STRAINERS:

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens with 3/64" perforations @ 233 per sq.in.
 - 1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 4. Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 5. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.
- B. Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following or approved equivalent:
 - 1. Armstrong Machine Works.
 - 2. Hoffman Specialty ITT; Fluid Handling Div.
 - 3. Metraflex Co.
 - 4. R-P&C Valve; Div. White Consolidated Industries, Inc.
 - 5. Spirax Sarco.
 - 6. Victaulic Co. of America.
 - 7. Watts Regulator Co.

2.4 DIELECTRIC UNIONS

- A. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.
- B. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following or approved equivalent:
 - 1. B & K Industries, Inc.
 - 2. Capital Mfg. Co.; Div. of Harsco Corp.
 - 3. Eclipse, Inc.

4. Epco Sales, Inc.
5. Perfection Corp.
6. Rockford-Eclipse Div.

2.5 MECHANICAL SLEEVE SEALS

- A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- B. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following or approved equivalent:
 1. Thunderline Corp.

2.6 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or duct work.
- B. Cracks, Voids, or Holes Up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 time when exposed to flame or heat, UL-listed.
- C. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350oF (121 to 177oC), UL-listed.
- D. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following or approved equivalent:
 1. Electro Products Div./3M.
 2. Nelson; Unit of General Signal.

2.7 WATER HAMMER ARRESTERS:

- A. General: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
- B. Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following or approved equivalent:
 1. Amtrol, Inc.
 2. Smith (Jay R.) Mfg. Co.
 3. Tyler Pipe; Sub. of Tyler Corp.
 4. Zurn Industries, Inc.; Hydromechanics Div.

2.8 FABRICATED PIPING SPECIALTIES:

- A. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
- B. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricated from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.
 2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
 1. Lead and Oakum: Caulked between sleeve and pipe.
 2. Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
 - 1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
 - a. Pumps
 - b. Temperature control valves
 - c. Pressure reducing valves
 - d. Temperature or pressure regulating valves
- C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- D. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- E. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.
- F. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.2 INSTALLATION OF FABRICATED PIPING SPECIALTIES:

- A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
- B. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
 - 1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
 - 2. Install iron-pipe sleeves at exterior penetrations; both above and below grade.
 - 3. Install steel-pipe or plastic-pipe sleeves except as otherwise indicated.
- C. Sleeve Seals: Install in accordance with the following:
 - 1. Lead and Oakum: Fill and pack annular space between sleeve and pipe with oakum, caulk with lead, on both sides.

END OF SECTION 22 11 19

SECTION 22 13 16 - SOIL AND WASTE SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of soil and waste systems work, is indicated on drawings and schedules, and by requirements of this section.
- B. Exterior sanitary sewer system is specified in other applicable specification sections, and is included as work of this section.
- C. Trenching and backfilling required in conjunction with underground building drain piping is specified in other applicable specification sections, and is included as work of this section.
- D. Refer to specification section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of soil and waste systems products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with soil and waste systems work similar to that required for project.
- C. Codes and Standards:
 - 1. Plumbing Code Compliance: Comply with applicable portions of Florida Building Code –Plumbing pertaining to plumbing materials construction and installation of products.
 - 2. ANSI Compliance: Comply with applicable ANSI standards pertaining to materials, products, and installation of soil and waste systems.
 - 3. ASSE Compliance: Comply with applicable ASSE standards pertaining to materials, products, and installation of soil and waste systems.
 - 4. PDI Compliance: Comply with applicable PDI standards pertaining to products and installation of soil and waste systems.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for soil and waste systems materials and products.
- B. Shop Drawings: Submit scaled layout drawings of soil and waste pipe and fittings including, but not necessarily limited to, pipe sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between piping and proximate equipment.
- C. Record Drawings: At project closeout, submit record drawings of installed soil and waste systems, in accordance with requirements of Division 00.
- D. Maintenance Data: Submit maintenance data and parts lists for soil and waste systems materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:

- A. General: Provide identification complying with Division 22 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
 - 1. Above Ground Soil, Waste, and Vent Piping: Plastic pipe markers.
 - 2. Underground Building Drain Piping: Underground-type plastic line markers.

2.3 BASIC PIPES AND PIPE FITTINGS:

- A. General: Provide pipes and pipe fittings complying with Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Above Ground Conductor Piping:
 - 1. Single Story Buildings - Pipe Size 10" and Smaller: Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.
 - 2. Two Story Buildings - Pipe Size 10" and Smaller: Hubless cast-iron soil pipe; Service weight; Hubless cast-iron soil pipe fittings; hubless joints, or polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.
- C. Underground Building Drain Piping:
 - 1. Pipe Size 8" and Smaller: Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.

2.4 BASIC PIPING SPECIALTIES:

- A. General: Provide piping specialties complying with Division 22 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
 - 1. Pipe Escutcheons.
 - 2. Mechanical Sleeve Seals.
 - 3. Pipe Sleeves.
 - 4. Sleeve Seals.

2.5 BASIC SUPPORTS AND ANCHORS:

- A. General: Provide supports and anchors complying with Division 22 Basic Mechanical Materials and Methods section "Supports and Anchors" in accordance with the following listing:
 - 1. Adjustable steel clevis hangers, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical piping supports.
 - 3. Concrete inserts, C-clamps, and steel brackets for building attachments.

2.6 DRAINAGE PIPING PRODUCTS:

- A. General: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.
- B. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.
- C. Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:
 - 1. Nickel-Bronze Top: Manufactures standard cast unit of the pattern indicated.
 - a. Pattern: Exposed flush type, standard non-slip scored or abrasive finish.

- D. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.
- E. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
- F. Vent Flashing Sleeves: Cast-iron caulking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.
- G. Manufacturer: Subject to compliance with requirements, provide drainage piping products of one of the following or approved equivalent:
 - 1. Josam Mfg. Co.
 - 2. Smith (Jay R.) Co.
 - 3. Tyler Pipe; Subs. of Tyler Corp.
 - 4. Zurn Industries Inc.; Hydromechanics Div.

2.7 FLOOR DRAINS:

- A. General: Provide floor drains of size and types as indicated on drawings. Provide trap primer connections in all floor drains.

2.8 TRAP PRIMERS:

- A. General: Provide bronze trap primer valve with automatic vacuum breaker, complying with ASSE 1018, with 1/2" connections matching mating piping system.
- B. Manufacturer: Subject to compliance with requirements, provide trap primers of one of the following or approved equivalent:
 - 1. Josam Mfg. Co.
 - 2. Precision Plumbing Products, Inc.
 - 3. Smith (Jay R.) Mfg. Co.
 - 4. Tyler Pipe; Subs. of Tyler Corp.
 - 5. Zurn Industries, Inc.; Hydromechanics Div.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:

- A. General: Install mechanical identification in accordance with Division 22 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF ABOVE GROUND PIPING:

- A. General: Install soil and waste piping in accordance with Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and with Florida Building Code –Plumbing.

3.4 INSTALLATION OF BUILDING DRAIN PIPING:

- A. General: Install underground building drains as indicated and in accordance with Florida Building Code – Plumbing. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- B. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.5 INSTALLATION OF PIPING SPECIALTIES:

- A. Install piping specialties in accordance with Division 22 Basic Mechanical Materials and Methods section "Piping Specialties".

3.6 INSTALLATION OF SUPPORTS AND ANCHORS:

- A. Install supports and anchors in accordance with Division 22 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.7 INSTALLATION OF DRAINAGE PIPING PRODUCTS:

- A. Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Florida Building Code – Plumbing, and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
- C. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

3.8 INSTALLATION OF FLOOR DRAINS:

- A. General: Install floor drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate flashing work with work of waterproofing and adjoining substrate work.
- C. Coordinate with soil and waste piping as necessary to interface floor drains with drainage piping systems.
- D. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated. Floor drains shall be suitable for the type of flooring.
- F. Position drains so that they are accessible and easy to maintain.

3.9 INSTALLATION OF TRAP PRIMERS:

- A. General: Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping toward drain trap, minimum of 1/8" per foot (1%). Adjust trap primer for proper flow.

3.10 EQUIPMENT CONNECTIONS:

- A. Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by Florida Building Code – Plumbing.
- B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.11 FIELD QUALITY CONTROL:

- A. Piping Tests: Test soil and waste systems in accordance with requirements of Florida Building Code – Plumbing.

3.12 ADJUSTING AND CLEANING:

- A. Clean, flush, and inspect soil and waste piping in accordance with requirements of Division 22 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.13 PROTECTION:

- A. Protect drains during remainder of construction period, to avoid clogging with construction materials and debris, and to prevent damage from traffic and construction work.

END OF SECTION 22 13 16

SECTION 22 43 20 - PLUMBING EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section
- B. Types of plumbing equipment required for project include the following:
 - 1. Domestic water heaters.
 - a. Electric water heaters.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacturer of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
- C. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- D. NSF Labels: Provide water heaters which have been listed and labeled by National Sanitation Foundation.
- E. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
- F. Mineral Standards: Provide mineral products for water softeners, acceptable under state and local public health control regulations.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.
- C. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual.

PART 2 - PRODUCTS

2.1 RESIDENTIAL ELECTRIC WATER HEATERS:

- A. General: Provide residential electric water heaters of size, capacity, and electrical characteristics as indicated on schedule. Comply with ANSI/ASHRAE/IES 90A for energy efficiency. Provide UL listing.
- B. Heater: Working pressure of 150 psi; magnesium anode rod; glass lining on internal surfaces exposed to water.

- C. Heating Elements: Low watt density with zinc plated copper sheath; double element, non-simultaneous operation.
- D. Safety Controls: Equip with high temperature cutoff for each element, factory wired.
- E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin-proof glass fiber insulation. Provide outer steel jacket with baked enamel finish.
- F. Warranty: Furnish 5 year limited warranty for tank leakage.
- G. Accessories: Provide brass drain valve; 3/4" relief valve; cold water dip tube.
- H. Controls: Provide thermostat for each element, factory wired.
- I. Manufacturer: Subject to compliance with requirements, provide residential electric water heaters of one of the following or approved equivalent:
 - 1. A.O. Smith, Consumer Products Div.
 - 2. Rheem Water Heater Div., City Investing Co.
 - 3. Ruud Water Heater Div., City Investing Co.
 - 4. State Industries.
 - 5. Viking Superior Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRIC WATER HEATERS:

- A. General: Install electric water heaters as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.
- B. Support: Set units on concrete pads, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.
- C. Electrical Supply: Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units; not work of this section.
- D. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union.
- E. Start-up: Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

END OF SECTION 22 43 20

SECTION 23 43 40 - PLUMBING FIXTURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-0 Specification sections, apply to work of this section.
- B. Division 22 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of plumbing fixtures work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of plumbing fixtures specified in this section include the following:
 - 1. Water closets.
 - 2. Lavatories.
 - 3. Water Fountains.
 - 4. Service sinks.
 - 5. Stainless steel sinks.
- C. Refer to Division 22 sections for potable water systems used in conjunction with plumbing fixtures; not work of this section.
- D. Refer to Division 22 sections for soil and waste systems used in conjunction with plumbing fixtures; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing fixtures of type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
 - 1. Plumbing Fixture Standards: Comply with applicable portions of Florida Building Code - Plumbing pertaining to materials and installation of plumbing fixtures.
 - 2. ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.
 - 3. PDI Compliance: Comply with standards established by PDI pertaining to plumbing fixture supports.
 - 4. Federal Standards: Comply with applicable FS WW-P-541/-Series sections pertaining to plumbing fixtures.
 - 5. ANSI Compliance: Construct and install barrier-free plumbing fixtures in accordance with Florida Building Code.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, furnished specialties and accessories; and installation instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, roughing-in requirements, required clearances, and methods of assembly of components and anchorages.

- C. Maintenance Data: Submit maintenance data and parts lists for each type of plumbing fixture and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 0.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES:

- A. General: Provide factory-fabricated fixtures of type, style, and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, and as required for complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.2 MATERIALS:

- A. General: Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals, and finishes. Comply with requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-specification.
- B. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- C. Where fittings, trim and accessories are exposed or semi-exposed provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.
- D. Stainless Steel Sheets: ASTM A 167, Type 302/304, hardest workable temper.
- E. Finish: No. 4, bright, directional polish on exposed surfaces.
- F. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ASTM C 554.
- G. Synthetic Stone: High quality, free from defects, glaze on exposed surfaces, stain resistant.

2.3 PLUMBING FITTINGS, TRIM, AND ACCESSORIES:

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.
- C. P-Traps: Include removable P-traps where drains are indicated for direct connection to drainage system.
- D. Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron as indicated.
- E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

- F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome-plated cast-brass escutcheons with set screw.
- G. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.
- H. Comply with additional fixture requirements contained in fixture schedule attached to this section.
- I. Manufacturer: Subject to compliance with requirements, provide plumbing fixtures of one of the following or approved equivalent:
 - 1. Plumbing Fixtures:
 - a. American Standard: U.S. Plumbing Products.
 - b. Kohler Co.
 - c. Zurn Industries, Inc.
 - d. Briggs
 - 2. Plumbing Trim:
 - a. Moen
 - b. Speakman Co.
 - c. Symmons
 - d. Zurn Industries, Inc.
 - e. Chicago
 - 3. Flush Valves:
 - a. Sloan Valve Co.
 - b. Zurn Industries, Inc.
 - 4. Fixture Seats:
 - a. Beneke Corp.
 - b. Bemis Mfg. Co.
 - c. Olsonite Corp.; Olsonite Seats.
 - 5. Water Coolers/Fountains:
 - a. Elkay Mfg. Co.
 - b. Halsey Taylor Div.; Household International Co.
 - c. Oasis International.
 - 6. Service Sinks:
 - a. American Standard; U.S. Plumbing Products.
 - b. Eljer Plumbingware Div; Household International Co.
 - c. Fiat Products.
 - d. Kohler Co.
 - e. Zurn Industries, Inc.
 - 7. Stainless Steel Sinks:
 - a. Elkay Mfg. Co.
 - b. Just Mfg. Co.
 - c. Kindred (Franke Consumer Products)
 - 8. Fixture Carriers:
 - a. Josam Mfg. Co.
 - b. Kohler Co.
 - c. Smith (Jay R.)
 - d. Tyler Pipe.
 - e. Zurn Industries, Inc.; Hydromechanics Div.
- J. Flow requirements: Provide plumbing fixtures that meet the following:

1. Water closets
 - a. Water Consumption: 1.28 gal per flush.
2. Lavatories
 - a. Maximum Flow Rate: 0.35 gpm.
3. Sinks
 - a. Maximum Flow Rate: 0.35 gpm .

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PLUMBING FIXTURES:

- A. General: Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of Florida Building Code -Plumbing pertaining to installation of plumbing fixtures.
- B. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.
- C. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL:

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

3.4 ADJUSTING AND CLEANING:

- A. Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation.
- B. Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow stream and specified gpm.
- C. Adjust or replace washers to prevent leaks at faucets and stops.

3.5 EXTRA STOCK:

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every 10 units.

END OF SECTION 22 43 40

SECTION 23 00 00 - MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Work herein shall conform to all applicable laws, ordinances, and to regulations of the local utility companies. The general conditions and all requirements of the contract documents shall apply to all work of this section. Work shall be in accordance with the requirements of:
 - 1. Florida Building Code (FBC) 6th Edition (2017): This code includes The 2017 FBC Building, Mechanical, Plumbing, Fuel Gas and Energy Conservation Volumes. Further, see "Referenced Standards" in the FBC, Building Chapter 35; FBC, Plumbing Chapter 14; FBC, Mechanical Chapter 15; FBC, Fuel Gas Chapter 8, FBC, Energy Conservation Chapter 5.) (Effective December 31, 2017)
 - 2. 6th Edition of the Florida Fire Prevention Code (FFPC): (This code also includes the Florida versions of NFPA 1 and NFPA 101.) (Effective December 31, 2017)
 - 3. 2014 National Electrical Code
- B. Cooperate with all other trades and install work as fast as the progress of the job will permit.
- C. Use only mechanics skilled in the work they are to perform and have a competent representative on the job when any work is being done.
- D. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.
- E. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.
- F. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.2 SPECIFICATIONS AND DRAWINGS

- A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.
- B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.
- C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing in pencil on sepia reproducibles, any deviations from the original Drawings, indicating in the Specifications each manufacturer's name underlined or inserted whose product was used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of sepia reproducibles of the original tracings will be furnished upon request for this purpose.

1.3 PERMITS, FEES AND INSPECTIONS:

- A. The Contractor shall satisfy the terms of the permits.
- B. Obtain all required certificates of inspection for work and deliver them to the Owner before requesting acceptance and final payment for the work.

- C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.
- D. The Contractor shall inform the Owner of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.4 GENERAL

- A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified. Substitutions shall not be permitted except as described herein and in the Supplementary and General Conditions.
- B. Since manufacturers reserve the right to change their products at any time, contractors shall verify all dimensions, performance data, etc. for each piece of equipment submitted to assure compliance with the intent of the drawings and specifications.
- C. All materials shall be new and of quality as specified, and when required, be clearly labeled and/or stamped as manufactured in the United States.
- D. Where an accepted substitution or deviation requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, contractor shall furnish said changes and additions and pay all costs for all changes and additions to his work and the work of others affected by this substitution or deviation.
- E. Deviations mean the use of any listed approved manufacturer other than those on which the drawings are based.

1.5 SHOP AND ERECTION DRAWINGS AND SAMPLES

- A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.
- B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.
- D. Prepare and submit shop drawings and submittals in accordance with Specifications Section 01 33 00 - SUBMITTAL PROCEDURES.
- E. Operation and Maintenance Manuals:
 - 1. Maintenance manuals shall be complete and shall be furnished in a loose leaf binder or in the manufacturer's standard binder. Information shall be sufficient to enable a qualified technician to perform normal first line maintenance and repair. A parts list shall be included which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
 - 2. Operation manuals shall be clear and concise and shall describe, in detail, the information required to properly operate the equipment specified. The manuals shall include complete catalog cuts and as-built wiring diagrams.
 - 3. Operation and maintenance manuals shall be submitted for approval prior to final inspection.
- F. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation,

when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.6 EXPERIENCE

- A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.7 COORDINATION WITH OTHER TRADES

- A. Contractor shall coordinate his work with other trades to avoid interferences and delays. He shall assist in working out space requirements to make a satisfactory installation.
- B. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with the work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
- C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.8 STORAGE OF MATERIALS

- A. All materials shall be stored on-site shall be coordinated with plant staff. All materials shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.
- B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.
- C. Provide continuous protection for all equipment already installed.

1.9 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

- A. Provide openings and excavation required for the installation of the work. Patch work and backfill as required. Finished work shall match the existing adjoining work.
- B. Verify all conditions affecting the work to be performed under this contract.
- C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Engineer.
- D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Engineer at no cost to the Owner and with no extension of time limitation.

1.10 REMOVAL OF RUBBISH

- A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work in accordance with Section 01700 - Construction Procedures. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Engineer.

1.11 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

- A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 15 Mechanical.

- B. Power wiring for motors and installation of starters shall be under Division 16 Electrical.
- C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be under Division 23 of Specifications, installed in accordance with requirements of Division 16.
- D. Motors shall be furnished under Division 23 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.
- E. Furnish and install all low voltage (120V and under) temperature control wiring for equipment provided under this division.
- F. Provide conduit when required for control wiring.

1.12 MOTORS

- A. All motors shall be furnished and installed under Division 23 Mechanical and shall be wired under Division 16 Electrical.
- B. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on roof mounted fan units and similar equipment.
- C. Unless indicated otherwise, motors shall be NEMA Design B with a service factor of 1.15 with total temperature rise of 90 degrees C. (resistance measured) in 40 degrees C. ambient when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 80 degrees C. in the above conditions. Motors located in areas exceeding 40 degrees C. ambient shall be factory rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Design N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.
- D. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Engineer of the change and shall then coordinate the change and shall pay all additional charges in connection with the change.
- E. All motors supplied on this project three (3) HP and larger shall have a power factor not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with this Code, shall be switched with the utilization equipment.
- F. All motors supplied on this project shall be energy efficient. All efficiency testing and labeling shall be performed in accordance with the NEMA Standard MG 1-12.54 and IEEE 112 Test Standard, Method B. Minimum efficiencies shall conform to the following listing:

Motor HP	Efficiency (%)
3/4	80.0
1	82.5
1-1/2	84.0
2	85.5
3	87.5
5	87.5
7-1/2	89.5
10	89.5

15

91.0

20

91.7

1.13 QUIET OPERATION AND VIBRATION

- A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.
- B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.14 EQUIPMENT IDENTIFICATION

- A. Each unit shall be identified by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include: supply and exhaust fans, air conditioning and heating machinery and apparatus, pumps, piping, control cabinets, and other equipment units as may be directed by the Engineer.

1.15 CLEANING AND ADJUSTMENTS

- A. Upon completion of the work, Contractor shall clean and lubricate fans, motors, and other running equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.
- B. Scratched or damaged painting shall be touched up as necessary to return the painting to "new" condition and appearance.
- C. All piping and equipment shall be thoroughly blown out under pressure and cleared of all foreign matter, wasting air, gas or water through temporary connections as long as necessary to thoroughly clean system before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter from getting into the piping system and equipment.
- D. During blow out period, baskets from strainers shall be removed, traps and control valves, etc., shall be by-passed.
- E. All cleaning shall be done prior to any sterilization, pressure testing, flow balancing or equipment adjustment procedures.
- F. During construction protect all piping and equipment from damage and dirt. Cap the open ends of all piping and equipment.

1.16 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.
- B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.17 TESTS

- A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Engineer. Provide all instruments, labor and services necessary to conduct tests.

1.18 INSTRUCTIONS

- A. Fully instruct Owner's personnel in the care and operation of mechanical systems and furnish a letter to the Engineer advising the particular person who has received such instruction.

1.19 GUARANTEE

- A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one year from date of final acceptance. Any defects appearing within this year period shall be repaired without additional cost to the Owner.

1.20 ACCEPTANCE

- A. Before requesting final inspection:
 - 1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
 - 2. Submit statement that equipment is properly installed, adjusted, fully lubricated and operation is satisfactory.
 - 3. Certify in writing to the Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Engineer.
 - 4. Submit copy of written guarantee.
 - 5. Submit copy of other data as may be outlined in these specifications.
- B. Copies of the above data shall be submitted to the Engineer prior to requesting final inspection.

1.21 FACILITY STARTUP BROCHURE

- A. At the completion of work, Contractor shall provide startup instruction in accordance with Section 01700 and shall submit a bound brochure containing the following:
 - 1. Shop Drawings
 - 2. Maintenance Manuals
 - 3. Control Wiring and Piping Diagrams
 - 4. Operating Instructions
 - 5. Copy of Guarantee
 - 6. Certificate of Instruction of Owner's Representative
 - 7. Certificate of Job Completion
 - 8. Record Documents
- B. Where projects are of sufficient size to make a single brochure impractical, several brochures shall be prepared by trade and As-Built Drawings may be submitted as a separate item.
- C. Brochure shall be indexed and divided for reasonable clarity.
- D. Brochure shall be turned over to the Engineer for review and approval. The contractor shall make modifications to the brochure as deemed necessary for compliance and clarity, by the Engineer, and re-submit the final brochure to the Engineer to be forwarded to the Owner.

END OF SECTION 23 00 00

SECTION 23 01 13 - DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of low and medium pressure ductwork is indicated on drawings and in schedules, and by requirements of this section.
- B. Definition of Pressure Classifications:
 - 1. Low Pressure/Low Velocity: Less than or equal to 2 inch water gauge (WG) positive or negative static pressure and velocities less than 2,500 FPM.
 - 2. Medium Pressure/Medium Velocity: 2 inch WG to 9 inch water gauge (WG) positive or negative static pressure and velocities greater than 2,500 FPM.
 - 3. High Pressure/High Velocity: 20 inch WG to 24 inch water gauge (WG) positive or negative static pressure and velocities greater than 3,600 FPM.
- C. Types of ductwork required for project include the following:
 - 1. Heating supply and return air systems.
 - 2. Air-conditioning supply and return air systems.
 - 3. Fresh air supply systems.
 - 4. Mechanical exhaust systems.
 - 5. Air relief systems.

1.3 QUALITY ASSURANCE:

- A. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards – Metal and Flexible, 1995" for fabrication and installation of low pressure ductwork.
- B. NFPA Compliance: Comply with ANSI/NFPA 90A "Standard for the Installation of Air-Conditioning and Ventilating Systems".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications on manufactured products and factory-fabricated ductwork, used for work of this section.
- B. Shop Drawings: Submit dimensioned layouts of ductwork, showing both the accurately scaled ductwork and its relation to space enclosure. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.
- C. Record Drawings: At project closeout, submit record drawings of installed ductwork, duct accessories, and outlets and inlets; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.
- B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS:

- A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.
- B. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.
- C. Stainless Steel Sheet: Dust Collector exhaust ductwork and as otherwise indicated, fabricate ductwork from stainless steel complying with ANSI/ASTM A 167; AISI type 304 with No. 4 directional polish where exposed to view in occupied spaces. Provide welded seams. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.2 MISCELLANEOUS DUCTWORK MATERIALS:

- A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
- C. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
- D. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
- E. Except where space is indicated as "High Humidity" area, interior support materials of not less than 1/4" diameter or 3/16" thickness may be plain (not galvanized).

2.3 FABRICATION:

- A. Shop fabricate ductwork in 4, 8, 10 or 12-foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for re-assembly and coordinated installation.
- B. Shop fabricate ductwork of gages and reinforcement complying with SMACNA "Low Pressure Duct Standards - 5th Edition".
- C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-23 section "Duct Accessories" for accessory requirements.
- E. Fabricate ductwork with perforated steel duct liner in each section of duct where indicated. Provide a continuous polyethylene liner on the acoustical liner to isolate the liner material from the airstream. Provide a perforated steel inner liner for strength and sound absorption.

2.4 FACTORY-FABRICATED DUCTWORK:

- A. General: At installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
- B. Material: Galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized.
- C. Gage: 28 ga. minimum for round and oval ducts and fittings, 4" through 24" diameter.
- D. Elbows: One piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
- E. Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.
- F. Manufacturer: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:
 - 1. Lindab
 - 2. United Sheet Metal Div., United McGill Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF DUCTWORK:

- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.
- B. Seal ductwork, after installation, to seal class recommended, and method prescribed in SMACNA "HVAC Duct Construction Standards - 1995 - 2nd Edition".
- C. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
- D. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- E. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.
- F. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2".
- G. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- H. Support ductwork in manner complying with SMACNA "Low Pressure Duct Standards - 5th Edition" hangers and supports section.

3.2 CLEANING AND PROTECTION:

- A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.3 BALANCING:

- A. Refer to Division-23 section "Testing, Adjusting, and Balancing" for air distribution balancing of low pressure ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 23 01 13

SECTION 23 01 75 - VARIABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Division 1 Specification Sections, apply to work of this section.

1.2 SCOPE

- A. The work, apparatus and materials which shall be furnished under these specifications and accompanying drawings shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete systems as indicated on the drawings and as specified herein.
- B. Coordinate all required interlocks with Division 26. Drives shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

1.3 DESCRIPTION OF WORK

- A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:
 - 1. Variable Frequency Drives.

1.4 QUALITY ASSURANCE

- A. The following Variable Frequency Drive Manufacturer: Allen Bradley.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.
- C. Codes and Standards:
 - 1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.
 - 2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.
 - 3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers and catalog information.
 - 2. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.
 - 3. Submit a Harmonic Distortion Analysis for the jobsite location.
 - 4. Surge suppression method and device.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY DRIVE

- A. Furnish complete variable frequency drives as specified herein for the fans and pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 12 enclosure, or other NEMA Type according to the installation and operating conditions at the job site.
- B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to negate the need for motor derating.
- C. An advanced sine wave approximation and voltage vector control shall be used to allow operation at rated motor shaft output at nominal speed with no derating. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life.
- D. The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Local representative panel shop assembly for option panels is not acceptable. The appropriate UL stickers shall be applied to both the drive and option panel, in the case where these are not contained in one panel.
- F. The VFD shall have a DC link reactor to minimize power line harmonics. If DC link reactors are not provided VFD shall be provided with a 3% impedance line reactor and isolation transformer.
- G. The VFD's full load amp rating shall meet or exceed NEC Table 430-230. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 260% of rated current for up to 0.5 second while starting.
- H. The VFD shall be able to provide full torque at any selected speed up to base speed to allow driving direct drive fans without derating.
- I. An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide a 3% to 10% additional energy savings.
- J. Input and output power circuit switching can be done without interlocks or damage to the VFD.
- K. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or decouple the motor from the load to run the test.
- L. Protective Features
 1. Class 20 I2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications.
 2. Protection against input transients, loss of AC line phase, short circuit, ground fault, overvoltage, undervoltage, drive overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.
 3. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 230 volts for 208/230 volt units, and 285 volts for 460 volt units.
 4. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
 5. Drive shall have semi-conductor rated input fuses to protect power components.

6. To prevent breakdown of the motor winding insulation, the dV/dt must be below 2300 V/msec per IEC recommendations. The supplier shall include with the quotation the dV/dt values of the drive.
7. Drive shall include a “signal loss detection” circuit to sense the loss of the control signal, and shall be programmable to react as desired in such instance.
8. Drive shall be designed and constructed so that input or outputs can be disconnected with the drive running without the need for interlocks.
9. Drive shall catch a rotating motor operating forward or reverse up to full speed.
10. VFD shall be rated for 100,000 amp interrupting capacity (AIC).
11. Drive shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
12. Drive shall continue to operate without faulting until input voltage exceeds 300 volts on 208/230 volt drives, and 604 volts on 460 volt drives.
 - a. Provide drive input and main fusing.
13. Provide surge suppression on the input of each drive for power and low voltage line protection. Devices shall be approved by the drive manufacturer. EDCO, DiTEK, Joslyn, or manufacturer’s approved equal.

M. Interface Features

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the drive and determine the speed reference.
2. Provide a 24 V DC output signal to indicate that the drive is in Auto/Remote mode.
3. Digital manual speed control. Potentiometers are not acceptable.
4. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.
5. All keypads shall be identical and interchangeable.
6. Drive may be operated with keypad removed.
7. All VLT 6000 drives shall use the same control keypad.
8. To setup multiple drives, it shall be possible to upload all setup parameters to the drive’s keypad, place that keypad on all other drives in turn and download the setup to each drive.
9. Display shall be programmable to display in 9 languages including English, Spanish and French.
10. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.
11. Two lines of the display shall allow free programming so that the exact unit controlled by the drive can be identified.
12. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the drive when the keypad is removed.
13. A quick setup menu with factory preset typical HVAC parameters shall be provided on the drive eliminating the need for macros.
14. The drive shall be fitted with an RS 485 serial communications port and be supplied with Windows® compatible software to display all monitoring, fault, alarm and status signals. The software shall allow parameter changes to be made to the drive settings, as well as storage of each controller’s operating and setup parameters, and remote operation of the drive.
23. Two set-point control interface (PID control) shall be standard in the unit. Drive shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
26. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.

17. Sleep mode shall be provided to automatically stop the drive when speed drops below set “sleep” level for a specified time. Drive automatically restarts when speed command exceeds set “wake” level.
 18. Run permissive circuit shall be provided to accept a “system ready” signal to assure that the drive does not start until dampers or other auxiliary equipment are in the proper state for drive operation.
 19. An elapsed time meter and kWh meter shall be provided.
 20. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, KWH, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature in degrees, and Motor Speed in engineering units per application (in percent speed, GPM, CFM,...). Drive will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.
 21. Up to four meter displays can be shown at once on the display. This allows the actual value of the follower signal to be shown simultaneously with the drive’s response to that signal for ease in commissioning.
 22. Drive will sense the loss of load and signal a no load/broken belt warning or fault.
 23. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
 24. The VFD shall store in memory the last 20 faults and record all operational data.
 25. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
 26. Two programmable relay outputs, one Form C 240 V AC, one Form A 50 V AC, shall be provided for remote indication of drive status.
 27. Two programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-20 mA and 4-20 mA.
 28. Two programmable analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input kW.
 29. Under fire mode conditions the VFD shall automatically default to a preset speed.
- N. Adjustments
1. VFD shall have an adjustable carrier frequency.
 2. Sixteen preset speeds shall be provided.
 3. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves may be automatically contoured to prevent tripping.
 4. Four current limit settings shall be provided.
 5. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit, inverter overload and motor overload.
 6. The number of restart attempts shall be selectable from 0 through 20 and the time between attempts shall be adjustable from 0 through 600 seconds.
 7. An automatic “on delay” may be selected from 0 to 120 seconds.
- O. Bypass
1. Provide a manual bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Provide a normally closed dry contact and interlock with

the drives safety trip circuitry to stop the motor whether in DRIVE or BYPASS mode in case of an external safety fault.

P. Service Conditions

1. Ambient temperature, -10 to 40°C (14 to 104°F).
2. to 95% relative humidity, non-condensing.
3. Elevation to 3,300 feet without derating.
4. AC line voltage variation, -10 to +10% of nominal with full output.
5. No side clearance shall be required for cooling of any NEMA 1 units, or of any NEMA 12 units of less than 75 HP at 460 volts. All power and control wiring shall be done from the bottom.

Q. Quality Assurance

1. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
2. All optional features shall be functionally tested at the factory for proper operation.

PART 3 - EXECUTION

3.1 DRIVES AND ASSOCIATED CONTROLS

- A. Unless otherwise indicated, drives shown on the drawings shall be furnished and installed under this section. The full load current and starting characteristics of each motor shall be verified for proper selection of motor over load devices. The Contractor shall furnish and install all steel shapes, etc., necessary for a support of all motor controllers.
- B. Unless otherwise indicated, all control devices, such as thermostats, firestats, etc., shall be installed in place and wired under other sections of the specifications. Coordinate required starter auxiliary contacts and coil voltages for a properly operational system.
- C. Motor controllers shall be installed in accordance with all applicable NEC installation requirements.
- D. Variable Frequency Drive Startup Assistance: The manufacturer shall provide start-up assistance in the form of a factory trained service technician. When factory authorized start-up is performed, the warranty shall be extended to 60 months from date of shipment. Provide training by factory trained service technician.

3.2 IDENTIFICATION OF EQUIPMENT

- A. Identification shall be provided for all motor controllers installed by the Contractor. Identification shall consist of white laminated plastic plates with black engraved letters.

END OF SECTION 23 01 75

SECTION 23 05 23 - VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division 23 Basic Mechanical Materials and Methods section, and is part of each Division 23 section making reference to valves specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 23 sections.
- B. Types of valves specified in this section include the following:
 - 1. Gate Valves.
 - 2. Drain Valves.
 - 3. Ball Valves.
 - 4. Butterfly Valves.
- C. Valves furnished as part of factory-fabricated equipment, are specified as part of equipment in other Division 23 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Valve Types: Provide valves of same type by same manufacturer.
- C. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.
- D. Codes and Standards:
- E. MSS Compliance: Mark valves in accordance with MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".
- F. ANSI Compliance: For face-to-face and end-to-end dimensions of flanged- or welded-end valve bodies, comply with ANSI B26.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
- B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 VALVES:

- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which

properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

- B. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
- C. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller.

2.2 GATE VALVES:

- A. Comply with the following standards:
 - 1. Cast-Iron Valves: MSS SP-70.
 - 2. Bronze Valves: MSS SP-80.
 - 3. Steel Valves: ANSI B26.34.
- B. Manufacturer: Subject to compliance with requirements, provide gate valves of one of the following:
 - 1. Crane Co.
 - 2. Fairbanks Co.
 - 3. Hammond Valve Corp.
 - 4. ITT Grinnell Valve Co., Inc.
 - 5. Jenkins Bros.
 - 6. Lunkenheimer Co.
 - 7. Milwaukee Valve Co., Inc.
 - 8. Nibco, Inc.
 - 9. Powell (Wm) Co.
 - 10. Stockham Valves and Fittings.
 - 11. Walworth Co.

2.3 DRAIN VALVES:

- A. Comply with the following standards:
 - 1. Water Heater Drain Valves: ASSE 1005.
- B. Manufacturer: Subject to compliance with requirements, provide globe valves of one of the following:
 - 1. Hammond Valve Corp.
 - 2. Lee Brothers; Div. Phelps Dodge Brass Co.
 - 3. Mansfield Plumbing Products.
 - 4. Nibco Inc.
 - 5. Prier Brass Mfg. Co.
 - 6. Tanner Mfg. Co.

2.4 BALL VALVES:

- A. Comply with the following standards:
 - 1. Cast-Iron Valves: MSS SP-72.
 - 2. Steel Valves: ANSI B26.34.
- B. Manufacturer: Subject to compliance with requirements, provide ball valves of one of the following:
 - 1. Conbraco Industries, Inc.
 - 2. Crane Co.
 - 3. Fairbanks Co.
 - 4. Hammond Valve Corp.
 - 5. ITT Grinnell Valve Co., Inc.

6. Jamesbury Corp.
7. Jenkins Bros.
8. Metraflex Co.
9. Nibco, Inc.
10. Powell (The Wm.) Co.
11. Stockham Valves and Fittings, Inc.
12. Walworth Co.
13. Watts Regulator Co.

2.5 BUTTERFLY VALVES:

- A. General: Comply with MSS SP-67. Provide lug-body type valves for all applications.
- B. Manufacturer: Subject to compliance with requirements, provide butterfly valves of one of the following:
 1. Center Line; Mark Controls Corp.
 2. Crane Co.
 3. Demco; Div. Cooper Industries, Inc.
 4. Fairbanks Co.
 5. ITT Grinnell Valve Co., Inc.
 6. Jamesbury Corp.
 7. Jenkins Bros.
 8. Keystone Valve USA.
 9. Nibco, Inc.
 10. Powell (The Wm.) Co.
 11. Stockham Valves and Fittings.

2.6 VALVE FEATURES:

- A. General: Provide valves with features indicated and, where not indicated otherwise, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
- B. Flanged: Valve flanges complying with ANSI B26.1 (cast iron), ANSI B26.5, (steel), or ANSI B26.24 (bronze).
- C. Threaded: Valve ends complying with ANSI B2.1.
- D. Socket-Welding: Valve ends complying with ANSI B26.11.
- E. Solder-Joint: Valve ends comply with ANSI B26.18.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Except as otherwise indicated, comply with the following requirements:
 1. Install valve where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
 2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Mechanical Actuators: Install mechanical actuators with chain operators where indicated. Extend chains to about 5' above floor and hook to clips to clear aisle passage.
- D. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
 - 1. Tube Size 2" and Smaller: Soldered-joint valves.
 - 2. Pipe Size 2" and Smaller: One of the following, at Installer's option:
 - a. Threaded valves.
 - b. Butt-welding valves
 - c. Socket-welding valves.
 - d. Flanged valves.
 - 3. Pipe Size 2 1/2" and Larger: One of the following, at Installer's option.
 - a. Grooved-end valves.
 - b. Butt-welding valves.
 - c. Socket-welding valves.
 - d. Flanged valves.
- E. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- F. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- G. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- H. Fluid Control: Except as otherwise indicated, install gate, ball, and butterfly valves to comply with ANSI B31.9. Where throttling is indicated or recognized as principal reason for valve, install butterfly valves, unless indicated otherwise on the plans.

3.2 ADJUSTING AND CLEANING:

- A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- B. Valve Identification: Tag each valve in accordance with Division 23 section "Mechanical Identification".
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.3 VALVE SCHEDULE:

- A. General: Provide the following valves for various valve types listed in Division 23 piping sections.

3.4 GATE VALVES:

- A. 2" and Smaller: Class 125, bronze, screw-in bonnet, rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	428	1334
Fairbanks:	0252	0282
Grinnell:	3010	3010-SJ

Hammond:	IB640	IB635
Jenkins:	47	1242
Lunkenheimer:	2127	2132
Milwaukee:	148	1149
Nibco:	T-111	S-111
Powell:	500-S	1821-S
Stockham:	B-100	B-108
Walworth:	55	55-SJ

B. 2" and Smaller: Class 125, bronze, screw-in bonnet, non-rising stem, solid wedge.

	Threaded	Solder
	Ends	Ends
Crane:	438	1324
Fairbanks:	0250	0280
Grinnell:	3000	3000-SJ
Hammond:	IB645	IB647
Jenkins:	370	1240
Lunkenheimer:	2129	2133
Milwaukee:	105	1145
Nibco:	T-113	S-113
Powell:	507	1822
Stockham:	B-103	B-104
Walworth:	55	4-SJ

C. 2 1/2" and Larger: Flanged ends, class 125, iron body, bolted bonnet, solid wedge, bronze mounted.

		Non-Rising
	OS&Y	Stem
Crane:	4651/2	461
Fairbanks:	0405	0403
Grinnell:	6020	6060
Hammond:	IR1140	IR1138
Jenkins:	651A	326
Lunkenheimer:	1430	1428
Milwaukee:	F-2885	F-2882
Nibco:	617-O	F-619
Powell:	1793	1787
Stockham:	G0623	G-612
Walworth:	8726-F	8719-F

D. Hose End, 2 1/2": FM, 174 psi, bronze body, solid wedge, inside screw, non-rising stem.

Provide cap and chain.

Fairbanks:	0210.
Jenkins:	707.
Lunkenheimer:	366.
Nibco:	T-103-HC.
Walworth:	123.

- E. Threaded End; 2" and Smaller: FM, UL-listed, 175 psi, bronze body, solid wedge, outside screw and yoke, rising stem.
 - Crane: 459.
 - Fairbanks: 0222.
 - Hammond: IB681.
 - Jenkins: 175U.
 - Nibco: T-104-O.
 - Stockham: B-133.
 - Walworth: 904.
- F. Flanged End; 2 1/2" and Larger: FM, UL-Listed, 175 psi, iron body bronze mounted, solid wedge, outside screw and yoke, rising stem.
 - Crane: 467.
 - Fairbanks: 0412.
 - Hammond: IR1234.
 - Jenkins: 825-A.
 - Nibco: F-607-O.
 - Stockham: G-634.
 - Walworth: 8713-F.

3.5 DRAIN VALVES:

- A. Class 125: Bronze body, screw-in bonnet, rising stem, composition disc, 3/4" hose outlet.

	Threaded Ends	Solder Ends
Hammond:	712	711
Lee:	717-20	717-12
Mansfield:	526.40	526.41
Nibco:	73	72
Prier:	C-73ST	C-71ST
Tanner:	806	851

3.6 BALL VALVES:

- A. 1" and Smaller: 230 psi, bronze body, standard port, bronze trim, 2-piece construction, TFE seats and seals.

	Threaded Ends	Solder Ends
Conbraco:	70	70
Crane:	2182	2182
Grinnell:	3700	3700-SJ
Jamesbury:	21-1100	-
Jenkins:	900T	902T
Metraflex:	IT	IS
Nibco:	T-585	S-585
Powell:	4520R20	421OR
Stockham:	S-226BRRT	S-226BRRS
Watts:B-6000	B-6001	

- A. 1 1/4" to 2": 230 psi, bronze body, standard port, 3-piece body, TFE seats with bronze trim.

	Threaded Ends	Solder Ends
Conbraco:	82	82
Fairbanks:	0851	-
Nibco:	T-595-Y	S-959-Y
Powell:	4201-R	4201-R
Watts:	B-6800	B-6801

3.7 BUTTERFLY VALVES:

- A. 6" and Smaller: 230 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, manual lever and lock.

Lug

CenterLine: Series LT

Crane: 14

Demco: Series CE

Fairbanks: 3502

Grinnell: WC-LC-8211

Hammond: 33824

Jamesbury: 8823L

Lug

Keystone: 10

Nibco:WL-NL-082-3

Powell: Series5000

Stockham: LD-711-BS3E

Grooved Ends: Victaulic Series 700.

- B. 8" and Larger: 230 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, gear operator.

Lug

CenterLine: SeriesLT

Crane: 14

Demco: SeriesCE

Fairbanks: 602

Grinnell: LC-8212

Keystone: 122

Nibco:NL-082-5

Powell: Series5000

Stockham: LD-721-BS3E

Grooved Ends: Victaulic Series 701.

END OF SECTION 23 05 23

SECTION 23 05 29 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is Division-23 Basic Mechanical Materials and Methods section, and is part of each Division-23 section making reference to supports and anchors specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division-23 sections.
- B. Types of supports and anchors specified in this section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Hanger-Rod Attachments.
 - 3. Building Attachments.
 - 4. Saddles and Shields.
 - 5. Miscellaneous Materials.
 - 6. Anchors.
 - 7. Equipment Supports.
- C. Supports and anchors furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-23 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. Code Compliance: Comply with Standard Plumbing Code 1994 pertaining to product materials and installation of supports and anchors.
 - 2. UL and FM Compliance: Provide products which are UL-listed and FM approved.
 - 3. MSS Standard Compliance:
 - a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
 - b. Select and apply pipe hangers and supports, complying with MSS SP-69.
 - c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - d. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 HORIZONTAL-PIPING HANGERS AND SUPPORTS:

- A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to

suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

- B. Adjustable Steel Clevis Hangers: MSS Type 1.
- C. Steel Double Bolt Pipe Clamps: MSS Type 3.
- D. Steel Pipe Clamps: MSS Type 4.
- E. Pipe Hangers: MSS Type 5.
- F. Split Pipe Rings: MSS Type 11.
- G. Clips: MSS Type 26.
- H. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
- I. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base-support and cast-iron floor flange.

2.3 HANGER-ROD ATTACHMENTS:

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
- B. Steel Turnbuckles: MSS Type 13.

2.4 BUILDING ATTACHMENTS:

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
- B. Concrete Inserts: MSS Type 18.
- C. Top Beam C-Clamps: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Steel Brackets: One of the following for indicated loading:
 - 1. Light Duty: MSS Type 31.
 - 2. Medium Duty: MSS Type 32.
 - 3. Heavy Duty: MSS Type 33.

2.5 SADDLES AND SHIELDS:

- A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D. Thermal Hanger Shields: Constructed of 360° insert of high density, 100 psi, water-proofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.

- E. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
 - 1. Elcen Metal Products Co.
 - 2. Pipe Shields, Inc.

2.6 MANUFACTURERS OF HANGERS AND SUPPORTS:

- A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - 1. B-Line Systems, Inc.
 - 2. Carpenter and Patterson, Inc.
 - 3. Corner & Lada Co., Inc.
 - 4. Elcen Metal Products Co.
 - 5. Fee & Mason Mfg. Co.; Div. Figgie International.
 - 6. ITT Grinnel Corp.

2.7 MISCELLANEOUS MATERIALS:

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.
- C. Cement Grout: Portland cement (ASTM C 230, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION:

- A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS:

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.4 INSTALLATION OF HANGERS AND SUPPORTS:

- A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- D. Provisions for movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
- G. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - 2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
 - 3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.5 INSTALLATION OF ANCHORS:

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.6 EQUIPMENT SUPPORTS:

- A. Provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 23. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

3.7 ADJUSTING AND CLEANING:

- A. Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments.
- B. Supports Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 05 29

SECTION 23 05 48 - NOISE AND VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to vibration isolation work specified herein.

1.2 DESCRIPTION OF WORK:

- A. Noise criteria, vibration tolerance, and vibration isolation for HVAC and plumbing work.

1.3 RELATED WORK

- A. Flexible Duct Connectors, Sound Attenuators and Sound Absorbing Duct Lining: Section 15910, DUCTWORK ACCESSORIES.
- B. Sound Tests and Vibration Tests: Section 15990, TESTING, ADJUSTING, AND BALANCING.

1.4 QUALITY ASSURANCE

- A. Refer to article, QUALITY ASSURANCE in Section 15010, BASIC METHODS AND REQUIREMENTS (MECHANICAL).
- B. Noise Criteria:
 - 1. Noise levels in all 8 octave bands due to equipment and duct systems shall not exceed the values indicated herein. The stated NC levels are "raw" NC levels and do not include room effect. Manufacturer's product data which includes a room attenuation or room effect are not acceptable and must be increased by the room effect.
 - 2. For equipment which has no sound power ratings scheduled on the plans, the contractor shall select equipment such that the indicated noise criteria, local ordinance noise levels, and OSHA requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE 1995 Applications Handbook, Chapter 43, SOUND AND VIBRATION CONTROL. An average value of 10 dB shall be used as the room attenuating effect, i.e., the difference between sound power level emitted to room and sound pressure level in room.
 - 3. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.
- C. Allowable Vibration Tolerances for Rotating, Non-reciprocating Equipment: Not to exceed a self-excited vibration maximum velocity of 0.20-inch per second RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:
 - 1. Vibration isolators:
 - a. Hangers.
 - b. Snubbers.
 - c. Thrust restraints.
- C. Isolator manufacturer shall furnish with submittal load calculations for selection of isolators, including supplemental bases, based on lowest operating speed of equipment supported.
- D. Sound attenuator manufacturer shall furnish with submittal sound attenuating capability of each sound attenuator provided.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 - 1. HVAC Applications Handbook 1991, Chapter 42, Sound and Vibration Control.
- C. American Society for Testing and Materials (ASTM):
 - 1. A123-89 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. A307-90 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 3. D2240-86 Rubber Property - Durometer Hardness
- D. Manufacturers Standardization (MSS):
 - 1. SP-58-88 Pipe Hangers and supports-Materials, Design and Manufacture
- E. Occupational Safety and Health Administration (OSHA):
 - 1. Occupational Noise Exposure

PART 2 - PRODUCTS

2.1 GENERAL

- A. Type of sound attenuator, isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated in the schedule on the drawings.
- B. Group 2: Offices NC 35
 - 1. Laboratories, private offices, lobby, corridors and open office areas.

2.2 VIBRATION ISOLATORS

- A. Hangers: Shall be combination neoprene and springs unless otherwise noted and shall allow for expansion of pipe.
 - 1. Combination Neoprene and Spring (Type H): Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
 - 2. Spring Position Hanger (Type HP): Similar to combination neoprene and spring hanger except hanger shall hold piping at a fixed elevation during installation and include a secondary adjustment feature to transfer load to spring while maintaining same position.
 - 3. Neoprene (Type HN): Vibration hanger shall contain a double deflection type neoprene isolation element. Hanger rod shall be separated from contact with hanger bracket by a neoprene grommet.
 - 4. Spring (Type HS): Vibration hanger shall contain a coiled steel spring in series with a neoprene grommet. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
 - 5. Hanger supports for piping 2-inches and larger shall have a pointer and scale deflection indicator.
- C. Snubbers: Each spring mounted base shall have a minimum of four all-directional or eight two directional (two per side) seismic snubbers that are double acting. Elastomeric materials shall be shock absorbent neoprene bridge quality bearing pads, maximum 60 durometer, replaceable and have a minimum thickness of 1/4-inch. Air gap between hard and resilient material shall be not less than 1/8-inch nor more than 1/4-inch. Restraints shall be capable of withstanding design load without permanent deformation.
- D. Thrust Restraints (Type THR): Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field

adjustable to allow 1/4-inch maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

- E. Manufacturer: Subject to compliance with requirements, provide vibration isolators of one of the following:
 - 1. Vibration Eliminator Co., Inc.
 - 2. Mason Industries

2.3 BASES

- A. Rails (Type R): Design rails with isolator brackets to reduce mounting height of equipment and cradle machines having legs or bases that do not require a complete supplementary base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension but not less than four-inches. Where rails are used with neoprene mounts for small fans or close coupled pumps, extend rails to compensate overhang of housing.
- B. Integral Structural Steel Base (Type B): Design base with isolator brackets to reduce mounting height of equipment which require a complete supplementary rigid base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension, but not less than four-inches.
- C. Inertia Base (Type I): Base shall be a reinforced concrete inertia base. Pour concrete into a welded steel channel frame, incorporating pre-located equipment anchor bolts and pipe sleeves. Level concrete to provide a smooth uniform bearing surface for equipment mounting. Provide grout under uneven supports. Channel depth shall be a minimum of 1/12 of longest dimension of base but not less than six inches. Form shall include 1/2-inch reinforcing bars welded in place on minimum of eight inch centers running both ways in a layer 1-1/2 inches above bottom. Use height saving brackets in all mounting locations. Weight of inertia base shall be equal to or greater than weight of equipment supported to provide a maximum peak-to-peak displacement of 1/16-inch.
- D. Curb Mounted Isolation Base (Type CB): Fabricate from aluminum to fit on top of standard curb with overlap to allow water run-off and have wind and water seals which shall not interfere with spring action. Provide resilient snubbers with 1/4-inch clearance for wind resistance. Top and bottom bearing surfaces shall have sponge type weather seals. Integral spring isolators shall comply with Spring Isolator (Type S) requirements.

2.4 GENERAL ISOLATOR REQUIREMENTS:

- A. Elastomeric isolators shall comply with ASTM D2240 and be oil resistant neoprene with a maximum stiffness of 60 durometer and have a straight-line deflection curve.
- B. Exposure to Weather: Isolators, including springs, exposed to weather shall be hot-dip galvanized after fabrication. Hot-dip zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.
- C. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.
- D. Color code isolator by type and size for easy identification of capacity.

2.5 DUCT SOUND ATTENUATORS

- A. General: Contractor shall furnish and install prefabricated silencers in the air handling system of the sizes and performance shown on schedule and/or on drawings. They shall be the product of a nationally known manufacturer who has engaged in the manufacture and distribution of this type of equipment for at least 5 years. Manufacturer shall, upon request, provide certified test reports from a nationally known qualified independent laboratory corroborating his cataloged performance. Test reports shall be based on a 24" x 24" cross sectional rectangular and/or 24" diameter tubular silencers of each type and model required for this project. Manufacturer shall obtain prior product approval from the architect and/or consulting engineer not less than 10 days before bid date.
- B. Outer casings shall be of not less than 22 gauge galvanized steel construction. All external seams shall be lockformed and filled with mastic, or continuously welded, and shall be airtight up to 10" water gauge pressure differential. Casings should be suitably stiffened to prevent permanent deformation when tested at 10" pressure differential. They shall not vibrate audibly during normal operation of air handling system.

- C. Interior partitions shall be of not less than 24 gauge galvanized steel perforated to remove not more than 18% of the area. Acoustically absorptive filler material made from an inorganic fiber-glass-like material (mineral wool or spun felt) shall be compressed not less than 5% to eliminate voids and prevent settling. Material shall be vermin and moisture proof and impart no odor to the air. Incombustible filler material shall exhibit not more than the following fire hazard classification values when tested in accordance with standard ASTM E84, NFPA 255 or UL-723 test methods:
- | | |
|---------------------|----|
| 1. Flamespread | 15 |
| 2. Fuel Contributed | 15 |
| 3. Smoke Developed | 0 |
- D. Provide polyethylene bagging for fill. Bagging shall be continuous and air tight and shall isolate the fill from the air stream.
- E. Acoustical ratings shall be determined by the "duct-to-reverberation room" method as recommended in 1960 by the S1W42 Subcommittee of the American Standards Association. Tests shall be run both with and without air flowing through silencer at not less than three different flow rates. All ratings shall be based on test data from a nationally known qualified independent laboratory. Test method shall eliminate effects due to end reflection, vibration, flanking transmission and standing waves in the reverberant room. Airflow and pressure loss data taken in accordance with AMCA procedures shall be obtained from the same silencer used for acoustic performance tests. Upon request, evidence will be shown of an airflow pressure drop calibration check with an independent laboratory certified by AMCA.
- F. Silencer shall provide the minimum attenuation values indicated on the drawings in terms of dB insertion Loss for models shown on drawings at design air velocities.
- G. The sound power level generated by airflow through silencer in dB re: 10^{-12} watts (PWL_{12}) shall not exceed the values indicated on the drawings at design flow rates.
- H. Airflow pressure drop performance of silencer shall not exceed values indicated on schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Vibration Isolation:
1. No metal-to-metal contact will be permitted between fixed and floating parts.
 2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, (etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.
 3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling, and bolting.
 4. Provide heat shields where elastomers are subject to temperatures over 100 degrees F.
 5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.
 6. Non-rotating equipment such as heat exchangers and converters shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.
- B. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.
- C. Duct Sound Attenuators: Install duct sound attenuators in strict conformance with manufacturer's written instructions. Maintain required lengths of straight duct upstream and downstream of the attenuator.

END OF SECTION 23 05 48

SECTION 23 05 53 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to identification devices specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division-15 sections.
- B. Types of identification devices specified in this section include the following:
 - 1. Painted Identification Materials.
 - 2. Plastic Pipe Markers.
 - 3. Plastic Tape.
 - 4. Valve Tags.
 - 5. Engraved Plastic-Laminate Signs.
 - 6. Plastic Equipment Markers.
 - 7. Plasticized Tags.
- C. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of equipment assembly in other Division-15 sections.
- D. Refer to Division-16 sections for identification requirements of electrical work; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide mechanical identification materials of one of the following:
 - 1. Allen Systems, Inc.
 - 2. Brady (W.H.) Co.; Signmark Div.
 - 3. Industrial Safety Supply Co., Inc.
 - 4. Seton Name Plate Corp.

2.2 MECHANICAL IDENTIFICATION MATERIALS:

- A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division-15 sections. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.3 PAINTED IDENTIFICATION MATERIALS:

- A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1-1/4" high letters for duct work and not less than 3/4" high letters for access door signs and similar operational instructions.
- B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
- C. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

2.4 PLASTIC PIPE MARKERS:

- A. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.
- B. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
- C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - 1. Adhesive lap joint in pipe marker overlap.
 - 2. Laminated or bonded application of pipe marker to pipe (or insulation).
 - 3. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
- D. Lettering: Comply with piping system nomenclature as specified, scheduled or shown, and abbreviate only as necessary for each application length.
- E. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.5 PLASTIC TAPE:

- A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.
- B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.
- C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.6 VALVE TAGS:

- A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
 - 1. Provide 1-1/2" diameter tags.
 - 2. Fill tag engraving with black enamel.
- B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- C. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.7 ENGRAVED PLASTIC-LAMINATE SIGNS:

- A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

- B. Thickness: 1/8".
 - C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
- 2.8 PLASTIC EQUIPMENT MARKERS:
- A. General: Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code:
 - 1. Green: Cooling equipment and components.
 - 2. Yellow/Green: Combination cooling and heating equipment and components.
 - 3. Blue: Equipment and components that do not meet any of the above criteria.
 - B. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - 1. Name and plan number.
 - 2. Equipment service.
 - 3. Design capacity.
 - 4. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.
 - C. Size: Provide approximate 2-1/2" x 4" markers for control devices, dampers, and valves; and 4-1/2" x 6" for equipment.
- 2.9 PLASTICIZED TAGS:
- A. General: Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4" x 5-5/8", with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).
- 2.10 LETTERING AND GRAPHICS:
- A. General: Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

PART 3 - EXECUTION

- 3.1 GENERAL INSTALLATION REQUIREMENTS:
- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- 3.2 PIPING SYSTEM IDENTIFICATION:
- A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
 - 1. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2" beyond ends of lettering.
 - 2. Stenciled markers, with lettering color complying with ANSI A13.1.
 - 3. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot non-insulated pipes.
 - 4. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.
 - B. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - 1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
4. At access doors, manholes, and similar access points which permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.3 VALVE IDENTIFICATION:

- A. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibbs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
- B. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
 1. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

3.4 MECHANICAL EQUIPMENT IDENTIFICATION:

- A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
 1. Main control and operating valves.
 2. Meters, gages, thermometers, and similar units.
 3. Fans, blowers, primary balancing dampers and mixing boxes.
 4. Packaged HVAC central-station and zone-type units.
- B. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, because of distance from normal location of required identification, stenciled signs may be provided in lieu of engraved plastic, at Installer's option.
- C. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
- D. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- E. Optional Use of Plasticized Tags: At Installer's option, where equipment to be identified as concealed above acoustical ceiling or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).

3.5 ADJUSTING AND CLEANING:

- A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
- B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, BALANCING, AND COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, of this specification division and Division 1 specification sections apply to work of this Section.

1.2 TESTING, BALANCING, AND COMMISSIONING OF HVAC SYSTEMS:

- A. Selection: The Contractor shall procure the services of, and have a contract with, an independent Test, Balance, and Commissioning Test and balance sub-contractor (Test and balance sub-contractor), which specializes in the balancing, testing, and commissioning of heating, ventilating, and air conditioning systems. The Test and balance sub-contractor shall balance, adjust, and test all water circulating and air moving equipment, air distribution, and exhaust systems, and temperature control equipment as herein specified and shown on the drawings.
- B. The Contractor shall award the test, balance and commissioning contract to the Test and balance sub-contractor as soon as possible to allow them to schedule the work in cooperation with other trades and to meet the completion date. The contractor shall prepare a critical path schedule, coordinated with all subcontractors, so as to accomplish all tasks required of the Test and balance sub-contractor as scheduled herein.
- C. Work performed under those sections in Division 15 is herein referred to as the Installer. Refer to specific items of work provided by each installer, and outlined in this section, "MECHANICAL CONTRACTORS RESPONSIBILITIES". Installers shall cooperate with the Test and balance sub-contractor as required during execution of the work under this section.
- D. The Test and balance sub-contractor shall inspect all work under the above sections as it relates to work under this section and report in writing to the Contractor and Engineer any deviations from plans and specifications that will affect the performance of the systems. All correspondence (written, fax, electronic mail, and the like) is to be copied to the owner.

1.3 TEST AND BALANCE SUB-CONTRACTOR QUALIFICATIONS:

- A. The Test and balance sub-contractor shall be a member in good standing with The Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) and shall provide AABC National Project Certification Performance Guaranty, or equivalent, to the owner upon request. The Test and balance sub-contractor must be totally independent, having no affiliation with any contractor, design engineer, or equipment manufacturer/supplier of HVAC related equipment.
- B. The Test and balance sub-contractor shall have a fully staffed office within fifty (50) miles of the site and have been regularly engaged in the testing, balancing, and commissioning of heating, ventilating, and air conditioning systems.
- C. The Test and balance sub-contractor shall provide proof that personnel performing work has successfully completed at least five (5) completed projects of similar size and scope, with at least three (3) completed projects with the City of Tampa. A complete list of reference projects, including name and phone number of contacts, shall be submitted with the bid.
- D. The Test and balance sub-contractor shall have a Florida Registered Professional Engineer on its staff.
- E. All instruments used shall be accurately calibrated within six months of balancing and maintained in good working order. If requested, the test shall be conducted in the presence of the Engineer and/or his representative.

1.4 TEST AND BALANCE SUB-CONTRACTOR SUBMITTALS:

- A. Provide a plan review within thirty days upon receipt of contract. The plan review should include comments and recommendations on any discrepancies that may hinder balancing. This plan review shall be transmitted directly to the Contractor.
- B. Submit to Contractor, equipment start-up forms. After receipt from the contractor of the submittal data, forms will be transmitted by the Test and balance sub-contractor to the Mechanical Contractor for use in equipment start-up. The completed forms will be turned over to the Test and balance sub-contractor prior to the beginning of the test and balance phase.
- C. Submit agenda of test procedures for each system, describing balancing standards for the testing, balancing, and commissioning of the air conditioning, heating, and ventilating systems for the approval of the Engineer. This agenda shall include all forms for each system and component, with specified data from the project plans and specifications included on the forms.
- D. The final Testing, Balancing, and Commissioning Report with the Engineer's letter of acceptance, must be received at least one week prior to the proposed date of the Substantial Completion Inspection.

1.5 TEST AND BALANCE SUB-CONTRACTOR INSPECTIONS AND TESTS:

- A. Make inspections of the systems during construction for proper installation of balancing devices and general construction as related to the test and balance work. The number of inspections will vary with size and complexity of the project, but a minimum of two inspections are required: one at 50% completion of ductwork installation, the second at 80% completion of ductwork installation. A written report of each job visit shall be sent to the Construction Manager for transmittal to the Engineer.
- B. Perform Final Test & Balance work associated with the HVAC system as described herein.
- C. A minimum of one after-occupancy inspection shall be made within 90 days of the final test and balance. At this time, any minor adjustments shall be made for occupant comfort. Major problems, which will require major readjustments, shall be addressed to the Architect / Engineer prior to any readjustments. Any alterations to the final test and balance report shall be transmitted as a revised report to the Construction Manager for transmittal to the Engineer.
- D. Provide for checking balance during opposite season (if tested in winter, recheck and update data during summer and vice versa). Send Opposite Season Report containing new and revised to the Construction Manager for distribution to the Engineer.

1.6 TEST AND BALANCE SUB-CONTRACTOR WARRANTY AND REPORTS:

- A. Provide AABC National Project Certification Performance Guarantee or equivalent.
- B. Include a one year warranty commencing on the date of substantial completion date of the entire project or commencing on the date of the final Testing, Balancing, Commissioning Report, whichever is later. During the Warranty period, the owner may request a recheck or resetting of any equipment or device listed in test report.
- C. Provide five copies of tabulated report in neatly organized typed form with AABC approved minimum data, within fifteen working days after completion of test. Report will include start-up reports and drawings to coincide with the test report. All commissioning tests will be included in a separate report format. In addition, all reports shall incorporate a summary page(s) which shall include:
 - 1. General description of project (building type, system type, equipment description, etc.)
 - 2. A descriptive list of all equipment and test results (sorted building by building) which do NOT meet plans and specifications. All equipment and test data NOT listed on the above mentioned summary page(s) will be considered to perform within 10% of design requirements.
 - 3. Copies of reduced plan drawings that uniquely identify and cross reference air devices, VAV boxes, dampers, equipment, etc.
 - 4. HVAC equipment approved submittals.
 - 5. Duct pressure test/leakage reports.

6. Commissioning Reports.
 7. Copies of all correspondence (written, fax, electronic mail and the like) between the Test and balance sub-contractor, Construction Manager, Subcontractor(s), Architect, Engineer, etc.
- D. The Owner reserves the right to provide verification of the test and balance reports and such verification shall be by a second independent test and balance sub-contractor. Reports found to be inaccurate will be disallowed and the test and balance test and balance sub-contractor will be required to repeat operations under the supervision of the second independent test and balance sub-contractor until accurate reports are completed and agreed upon. The cost of initial checking will be borne by the Contractor/Owner, unless the report is found to be inaccurate. In such case, the costs of the verification test and balance and all subsequent costs of supervision in order to secure acceptable reports will be borne by the test and balance test and balance sub-contractor.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES:

- A. Final testing, balancing and commissioning of the HVAC systems shall be performed as specified above. It is the responsibility of the Mechanical Contractor to be completely familiar with all the provisions and responsibilities of the Test and balance sub-contractor, and to provide such certification, cooperation, and support required.
- B. HVAC systems will not be accepted as complete, or the project accepted as substantially complete, until such time as the Test and balance sub-contractor reports that the HVAC systems are operating within acceptable limits, are in accordance with the contract documents, and are in receipt of approved duct leakage reports.
- C. The Contractor shall repair all deficiencies noted by the Test and balance sub-contractor in a timely manner. The Test and balance sub-contractor will notify the contractor in writing, on a daily basis, of any deficiencies discovered and Contractor will notify the Test and balance sub-contractor in writing upon completion of the repairs. The cost for extra re-testing by the Test and balance sub-contractor due to un-repaired items that were certified as repaired, will be the responsibility of the Contractor.
- D. The Contractor shall:
 1. Allow adequate time in the construction schedule to perform the Testing & Balancing and Commissioning work.
 2. Notify the Construction Manager and the Test and balance sub-contractor immediately upon commencement of work related to the HVAC system.
 3. Provide required shop drawings and all equipment data to the Architect / Engineer and to the selected Test and balance sub-contractor, with a copy of the transmittal letter sent to the Architect / Engineer.
 4. Provide test openings as required for testing and balancing HVAC systems.
 5. Provide updated job schedule and timely notice prior to scheduled events.
 6. Provide test openings and temporary end caps or otherwise seal off ends of ductwork to permit leakage testing prior to installation of diffusers, grilles, and similar devices.
 7. Make preliminary tests to establish adequacy, quality, safety, completed status, and satisfactory operation of HVAC systems and components. The systems shall be free of electrical grounds and short circuits.
 8. Perform duct leakage tests, in the presence of the test and balance sub-contractor, on all supply, return, outside air make-up, and exhaust air systems.

9. Within the intent of the contract documents, provide, at the request of the Test and balance sub-contractor, all equipment, material, supplies, workmen, and supervisions necessary to provide a satisfactory, operating system.
10. During the test and balance period, operate all HVAC equipment as necessary to permit systems to be tested and balanced as fully operating, functional systems.
11. Work harmoniously with the Test and balance sub-contractor, providing all courtesies normally extended to professional consultants.
12. Perform all work necessary to make ceiling space plenums air-tight and functional.
13. Remove and replace ceilings as necessary to permit test and balance operations.
14. Remove and replace equipment, lights, or other items which obstruct testing and balancing operations. Where equipment, lights, or other items will interfere with future adjustments of the HVAC system, such equipment, lights, or other items shall be relocated as directed by the Architect / Engineer.
15. Provide completed start-up forms on each piece of equipment.
16. Replace belts and drives as required for proper balancing. Drives shall be adjusted and aligned to prevent abnormal belt wear and vibration.
17. Adjust fan speed to full load motor amperage, but, not over full load.
18. Open all manually adjustable dampers and test dampers for smooth, vibration-free operation.
19. Verify that all controls are installed and operating in accordance with the control sequence of operation.
20. Before requesting final testing and balancing, submit signed statement that HVAC systems are installed, adjusted, fully lubricated, operating satisfactorily, and are ready for use.
21. Duct Leakage Report: The Mechanical Contractor to make all the supply, return, outside air, and exhaust duct systems operationally air-tight, to be no more than 2% leakage for duct systems rated at 2" w.c. pressure class, and 1% leakage for systems exceeding 2" w.c. pressure class. Leakage test to be performed with all air device openings and fan connections sealed airtight. Test the systems prior to applying any insulation or concealing in soffits or chases. Use a portable fan capable of producing a static pressure equal or greater than the duct test pressure. This fan to have a flow measuring assembly consisting of a straight section of duct with an orifice plate, pressure taps, and a calibrated performance curve for determining leakage rates.
22. Test each section equal to the external static pressure indicated for that fan or air handler with the portable fan assembly. After the fan achieves that steady state design pressure, record the air flow quantity across the orifice and the percent of design air flow. If the test fails, the contractor shall reseal and retest at no additional cost to the contract.
23. Repair all duct leaks that can be heard or felt, even if the system has passed the leakage test.
24. Submit duct leakage reports to the Test and balance sub-contractor and the Engineer for their review and approval.

3.2 TEST AND BALANCE SUB-CONTRACTOR'S RESPONSIBILITIES:

- A. Air Balance: The Test and balance sub-contractor shall perform the following tests, and balance system in accordance with the following requirements:
 1. Record minimum data required by AABC forms.
 2. Test and adjust fan rpm to design requirements.
 3. Test and record motor full load amperage/voltage and operating amperage/voltage.
 4. Make pitot tube traverse of main supply, return, OA and exhaust ducts and obtain design cfm at fans (where possible).
 - a. The air flow in rectangular ducts shall be traversed and measured using the log-Tchebycheff method and round duct shall be measured with the log-Linear method (a.k.a. log-Tchebycheff), no exceptions. Refer to the AABC's 1989 National Standards manual

Chapter 8; NEBB's latest Procedural Standards, Section 10; and ASHRAE's 2001 Fundamentals Handbook, Chapter 14.

5. Test and adjust system for design cfm recirculated air.
 6. Test and adjust system for design cfm outside air.
 7. Test and record system static pressure profile.
 8. Adjust all main supply and return air ducts to proper design cfm.
 9. Adjust all zones to proper design cfm, supply, return, and exhaust.
 10. Adjust all VV terminals to design minimum, maximum and/or heat cfm and record controller setpoint.
 11. Provide suggestion/corrective measures pertaining to performance related issues.
 12. Test and adjust each diffuser, grille, and register to within 10% of design requirements.
 13. Each grille, diffuser, and register shall be identified as to the location, area, and system.
 14. Test and adjust fan to within 100%-110% of design.
 15. Test and adjust kitchen hoods. Traverse exhaust duct. Seal test holes through the duct access panel with flat head bolts inserted from inside the duct.
- B. Size, AK catalog factors of diffusers, grilles, registers, and all tested equipment shall be identified and listed.
- C. Readings and test of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm, and and test resultant cfm after adjustments. When direct cfm measuring instruments are used, velocities are not required.
- D. In cooperation with the controls contractor, set adjustments of automatically operated dampers to operate as specified, indicated, and / or noted.
- E. Check all controls for proper calibrations, and list all controls requiring adjustment by control installers. A software point by point check-out and test, along with verification forms, will be required.
- F. All diffusers, grilles, and registers shall be adjusted to minimize drafts in all areas.
- G. Witness and record the testing of the ductwork for leakage to insure proper sealing. The Test and balance sub-contractor shall randomly select sections of the completed duct system for testing. The sections selected shall not exceed more than 20% of the measured linear footage of supply, return, exhaust or plenum duct length. All selected ductwork shall be leak tested in accordance with SMACNA. Maximum allowable leakage at any tested section shall not exceed 2% of the total air. If any of the selected duct sections exceed the specific leakage allowance, those sections shall be repaired by the Mechanical Contractor and retested by the Test and balance sub-contractor. If initial testing exceeds specification allowance, testing of all remaining duct ductwork shall be required at the Mechanical Contractor's expense. All additional costs for duct leak repair and retesting shall be the responsibility of the Mechanical Contractor.
- H. Advise Mechanical Contractor in writing of all ductwork that shall be repaired to reduce air leakage. Retest to confirm minimum allowable leakage. The cost of retest of failed systems will be the responsibility of the Mechanical Contractor.
- I. Water Balance: The Test and balance sub-contractor shall prepare the water systems for balancing in the following manner:
1. Open all valves to full open position. Close all bypass valves. Set modulating valve to full coil flow.
 2. Check all strainers where gauge taps are provided, and if required, direct Mechanical Contractor to clean same.
 3. Examine water in system and determine if the water has been treated and cleaned. If water has mud or other entrained matter, test and balance work shall stop and Mechanical Contractor shall clean system as specified in other sections of this Division 15 specification.
 4. Check pump rotation.

5. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
 6. Check all air vents at high points of water systems and determine all are installed and operating freely.
 7. Check coils for counterflow or parallel flow as called for by design.
 8. Set all temperature controls so all coils are calling for full cooling or heating. This should close all automatic bypass valves at coils.
 9. Check operation of automatic bypass valves.
 10. Check and have control contractor set operating temperatures of chillers / boilers to design requirements.
 11. Complete air balance must have been accomplished before actual water balance is complete.
- J. Chilled Water:
1. Check water temperature at inlet side of coils.
 2. Proceed to balance each water coil. Upon completion of flow readings and adjustments at coils, mark all settings and record data.
 3. All flow devices to be balanced to within +10% of design.
 4. Record and check the following items at each cooling / heating element:
 5. Test and record entering air temperature (DB heating and cooling).
 6. Test and record entering air temperatures (WB cooling).
 7. Test and record leaving air temperatures (DB heating and cooling).
 8. Test and record leaving air temperatures (WB cooling).
 9. Entering and leaving water temperature.
 10. Pressure drop of each coil or vessel.
 11. Calculate gpm.
 12. Calculate total cooling and heating coil capacities.
 13. If test conditions are not within design tolerance, then convert the test conditions to design conditions, or re-test when conditions are closer to design (i.e. opposite season test).
- K. Controls Testing: Test and record control temperature or pressure readout of each device and compare to actual measured condition. Include in report.
1. Test Each Sequence Of Operation for all systems to verify proper operation. Include description of operation in report.
 2. Record The Dry Bulb Temperature in each space and in addition, record a wet bulb temperature at each thermostat or sensor.
- L. Deficiencies: All deficiencies shall be noted by the Test and balance sub-contractor in a field report and submitted to Contractor and the Architect on a daily basis.
- M. Upon Correction Of The Deficiency, the Contractor shall notify the Test and balance sub-contractor in writing that the problem is resolved. If the deficiency is not corrected, the Contractor will be responsible for the cost of additional re-testing.
- N. Equipment: All information required as shown, but not limited to, shall be compiled in a neat, orderly, itemized format on 8½" x 11" test forms. The following data shall be submitted to the Owner through the Contractor. This data is the minimum required data except where specified standard (i.e. AABC) requires additional data. In addition, any HVAC equipment specified for the project, but not indicated below, is required per AABC form.
- O. Air Handlers:
1. Mark number
 2. Unit manufacturers and model number
 3. Total supply air cfm and rpm - specified and actual

4. Return air cfm - specified and actual
 5. Outside air cfm - specified and actual
 6. Unit static pressure profile, including total fan static
 7. Specified total and external static pressure
 8. Water gpm flow, coil pressure drop, and entering and leaving temps - specified and actual
 9. Coil - entering and leaving air DB deg F and WB deg F - specified and actual
 10. Outside air DB deg F and WB deg F at time of test
 11. Voltage, phase, and cycle specified load conditions
 12. Btu per hour at test conditions
 13. Btu per hour when converted to specified load conditions
 14. gpm by means of heat transfer test
- R. Fans:
1. Mark number
 2. Manufacturer and model number
 3. Total cfm supply and rpm - specified and actual
 4. Static pressure (discharge static - suction static)
 5. Full load amperage - specified and actual
 6. Voltage, phase, and cycles - specified and actual
- S. Air Devices (grilles, Registers, Diffusers, and Louvers):
1. Mark number
 2. Room number
 3. cfm - specified and actual
 4. Size
 5. Effective area
 6. Velocity FPM - specified and actual
- T. Variable Volume Boxes:
1. Mark number
 2. Unit manufacturer and model number
 3. Location and room number
 4. Air handler number.
 5. Heating coil
 6. Maximum / minimum and heating supply cfm - specified and actual
 7. For DDC controls: measure and record computer readout and calibration factor at design conditions.

END OF SECTION 23 05 93

SECTION 23 07 00 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping System Insulation:
 - a. Fiberglass
 - b. Cellular Glass.
 - c. Flexible Unicellular.
 - 2. Duct Work System Insulation:
 - a. Fiberglass.
- C. Refer to Division-15 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D. Refer to Division-15 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
- D. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 1. Armstrong World Industries, Inc.
 2. CertainTeed Corp.
 3. Knauf Fiber Glass GmbH.
 4. Manville Products Corp.
 5. Owens-Corning Fiberglas Corp.
 6. Pittsburgh Corning Corp.
 7. Rubatex Corp.

2.2 PIPING INSULATION MATERIALS:

- A. Fiberglass Piping Insulation: ASTM C 547, Class 1.
- B. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2.
- C. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.
- D. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.
- E. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
- F. Encase exterior piping insulation with aluminum jacket with weatherproof construction.
- G. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- H. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

2.3 DUCTWORK INSULATION MATERIALS:

- A. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.
- B. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.
- C. Jackets for Ductwork Insulation: ASTM C 921, Type I.
- D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
- E. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PLUMBING PIPING SYSTEM INSULATION:

- A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
- B. Cold Piping:
 - 1. Application Requirements: Insulate the following cold plumbing piping systems:
 - a. Interior above-ground sanitary drain pipes which receive condensate.
 - b. Interior above-ground storm water piping.
 - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
 - a. Flexible Unicellular: 1/2" thickness.
- C. Hot Piping:
 - 1. Application Requirements: Insulate the following hot plumbing piping systems:
 - a. Potable hot water piping.
 - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
 - a. Fiberglass: 1" thick for pipe sizes up to and including 6".

3.3 HVAC PIPING SYSTEM INSULATION:

- A. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints.
- B. Cold Piping (40°F (4.4°C) to ambient).
 - 1. Application Requirements: Insulate the following cold HVAC piping systems:
 - a. HVAC chilled water supply and return piping.
 - b. Air conditioning condensate drain piping.
 - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
 - a. Cellular Glass: 1-1/2" thick for pipe sizes up to and including 4", 2" thick for pipe sizes over 4".

3.4 DUCTWORK SYSTEM INSULATION:

- A. Insulation Omitted: Do not insulate fibrous glass ductwork, or lined ductwork.
- B. Cold Ductwork (Below Ambient Temperature):
 - 1. Application Requirements: Insulate the following cold ductwork.
 - a. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
 - b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
 - c. Insulate neck and bells of supply diffusers.
 - d. HVAC return ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums.
 - e. HVAC plenums and unit housings not pre-insulated at factory or lined.
 - 2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
 - a. Rigid Fiberglass: 1-1/2" thick, increase thickness to 2" in machine, fan and equipment rooms, or

- b. Flexible Fiberglass: 1-1/2" thick, application limited to concealed locations.

3.5 INSTALLATION OF PIPING INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings, and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- G. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise indicated.
- H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.6 INSTALLATION OF DUCTWORK INSULATION:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
- E. Extend ductwork insulation without interruption through walls, floors, and similar ductwork penetrations, except where otherwise indicated.
- F. Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.7 PROTECTION AND REPLACEMENT:

- A. Replace damaged insulation which cannot be satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 23 07 00

SECTION 23 08 00 – COMMISSIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The owner shall, at the expense of the owner, procure the services of an independent System Commissioning Agent.
- B. Commissioning will be performed as required by the 6th Edition of the Florida Building Code (2017), section C408:
 - 1. 3.1.3.1.2 - Pre-commissioning; Document the building's "Basis of Design" for building systems as per ASHRAE Guideline 0-2005 Annex K (or more recent version).
 - 2. 3.1.3.3.1 – Training; Training for the building operators on the systems listed above in accordance with ASHRAE Guideline 0-2005: The Commissioning Process, Article 7.2.14 (or more recent version).
- C. Section includes commissioning for the following systems, assemblies, and equipment:
 - 1. Cooling generation systems, including direct-expansion systems.
 - 2. Distribution systems, including air distribution (heating and cooling) systems, exhaust systems, energy recovery units, and air-handling units.
 - 3. Controls and instrumentation, including DDC system/BAS, energy monitoring and control system.
 - 4. Systems testing and balancing verification, including supply-air systems return-air systems, exhaust-air systems.

1.3 RELATED DOCUMENTS

- A. Section 01 33 29 - Sustainable Design Reporting
- B. Section 23 05 93 - Test and Balancing for HVAC Systems
- C. Section 23 09 23 - HVAC Control Systems

PART 2 - PRODUCTS (NOT USED)

PART 3 - RESPONSIBILITIES

3.1 CONTRACTOR'S RESPONSIBILITIES

- A. The contractor shall coordinate the construction activities to allow appropriate time for commissioning.
- B. The contractor shall have the appropriate personal and sub-contractors on site and facilitate access during the commissioning activities. Subcontractors required to assist are:
 - 1. Division 23 Testing and Balancing Agency
- C. Submittals shall include the following:
 - 1. Final Test and Balance report per section 23 0593.
 - 2. Start-up reports
 - 3. Commissioning Agents Forms

3.2 CONTROLS CONTRACTOR'S RESPONSIBILITIES

- A. The Controls contractor is contracted directly to the General Contract.
- B. The Controls contractor shall have the appropriate personal and sub-contractors on site and facilitate access during the commissioning activities
- C. Submittals shall include the following:
 - 1. Commissioning Agents Forms

3.3 COMMISSIONER'S RESPONSIBILITIES

- A. The A/E (commissioning agent) is contracted directly to the Owner.
- B. Preconstruction Phase:
 - 1. Develop "Basis of Design" (BOD) Commissioning Plan with the following items:
 - a. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
 - b. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
 - c. Functions to be tested, including, but not limited to calibrations and economizer controls.
 - d. Conditions under which the test will be performed. At a minimum, testing shall affirm winter and summer design conditions and full outside air conditions.
 - e. Measurable criteria for performance.
- C. Construction Phase:
 - 1. Review completed test and balance report and prepare commissioning test and balance review.
 - 2. Perform functional performance testing of:
 - a. Equipment - Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed. Testing shall include all modes and sequence of operation, including under full-load, part-load and the following emergency conditions:
 - 3. All modes as described in the sequence of operation;
 - 4. Redundant or automatic back-up mode;
 - 5. Performance of alarms; and
 - 6. Mode of operation upon a loss of power and restoration of power.
 - a. Controls - HVAC control systems shall be tested to document that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to document they operate in accordance with approved plans and specifications.

3.4 COMMISSIONER SUBMITTALS

- A. Preliminary Commissioning Report -A preliminary report of commissioning test procedures and results shall be completed and certified by the registered design professional or approved agency and provided to the owner.
 - 1. The report shall be identified as "Preliminary Commissioning Report" and shall identify:
 - a. Itemization of deficiencies found during testing required by this section that have not been corrected at the time of report preparation.
 - b. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.
 - c. Climatic conditions required for performance of the deferred tests.

2. The Code Official shall be permitted to require that a copy of the Preliminary Commissioning Report be made available for review by the Code Official.
- B. Final Commissioning Report - A report of test procedures and results identified as “Final Commissioning Report” shall be delivered to the Owner and shall include:
1. Results of functional performance tests.
 2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
 3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.
 4. Commissioning Agent’s test and balance review report.
 5. Final edition of the test and balance report.
 6. Basis of Design (Green Globes 3.1.3.1.2)
 7. Training verification statement. (Green Globes 3.1.3.3.1)

END OF SECTION 23 08 00

SECTION 23 09 00 - HVAC CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions of the Specifications, and Division 1 Specifications sections apply to this work.
- B. Division 23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 GENERAL REQUIREMENTS:

- A. Examine other Sections of the Specifications for requirements that affect work of this Division whether or not such work is specifically mentioned in this Division.
- B. Coordinate work with that of other trades affecting, or affected by work of this Division. Cooperate with those trades to assure steady progress of work under contract. It is this controls sub-contractor's responsibility to neatly "line item" work and responsibilities in their bid, of other subcontractors described in this section that are required for a complete HVAC controls system.

1.3 DESCRIPTION OF WORK:

- A. Provide a new control system as manufactured by KMC in conformance with these specifications and the requirements of the drawings.
- B. Controls applicable to this section include, but are not limited to temperature and humidity sensors, automatic water valves with electric actuators, automatic dampers, control relays, flow meters, and related devices. Work of this Contractor includes installation in conduit, wiring, wells, and enclosures necessary to provide a complete and operable system of controls.
- C. The programmable controllers shall be programmed by the controls sub-contractor to be compatible with the building automation systems software. Systems shall communicate via IP/IXP protocol.
- D. Extent of the direct digital control and energy management systems work required by this section is indicated on drawings and schedules, and by requirements of this section.
- E. Control sequences and control point list are specified on the drawings as "Sequence of Operation".
- F. Refer to other Division-23 sections for installation of instrument wells, valves, and dampers in mechanical systems. Coordinate and communicate with the general contractor that this is not work of this section.
- G. Refer to Division-26 sections for power supply wiring for power source to power connection on controls and/or unit control panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

1.4 CONTROLS SUB-CONTRACTOR QUALIFICATIONS:

- A. Acceptable manufacturers of control equipment are KMC. The controls sub-contractor is to be in the exclusive business of installing and factory-representing the above manufacturers. The controls sub-contractor shall have a minimum of five (5) years' experience in the programming, installation and service of commercial DDC control systems. Upon request, the controls sub-contractor shall provide the names and qualifications of the following, who assigned to this project.
 - 1. controls programmer
 - 2. controls equipment installer
 - 3. controls system analyst
- B. The controls sub-contractor shall retain the services of a Professional Engineer registered in Florida for performing the functions described below as they apply to the temperature control system.
- C. Responsibilities regarding field equipment start-up and checkout
 - 1. Provide support to the contractor to insure all control devices are properly interfaced with HVAC equipment.
 - 2. Perform a point-to-point operational check of each analog and digital point with owner representative present.

3. Power up the panels and verify correct power operation.
4. Verify communications line integrity.
5. Write all software programs and database.
6. Install all software and database in the system.
7. Verify operation of all operating software.
8. Calibrate/adjust/setup field devices as necessary in the order to provide a complete and proper operating system.
9. Notify engineer of any problems related to the design within two (2) working days of find.
10. Work with the engineer to validate operation and final completion of the project.
11. Work with the test and balance agency in balancing and adjusting the HVAC system.

D. Acceptance of the installation

1. Once the job is installed and the controls sub-contractor has thoroughly checked it, then it will be necessary to demonstrate to the Engineer that the project specifications have been met. The controls sub-contractor shall prepare technical demonstrations to the Engineer requiring a random test of not less than 50% of the system points. A representative of the owner must be invited to observe and given 48 hours prior notice prior to the demonstration. The demonstration will occur concurrent with the substantial completion inspection for the project.
2. The controls sub-contractor will provide the necessary data at the time of the demonstration, such that the Engineer can certify the project as complete.
3. The owner will accept the project as substantially complete only after the complete control system has been certified, in writing complete by the engineer and the system has been successfully demonstrated in accordance with the above criteria.

E. Record Drawing Responsibilities

1. The responsibility of the controls sub-contractor to see that the owner receives three (3) complete sets of record drawings and controls program. Provide digital copy of record drawings in PDF. Any and all changes in the project design package shall be reflected in the owner's record drawings before sign off and acceptance by the owner. As-built changes made in the field shall also be reflected in the record drawings.

1.5 DESCRIPTION OF RESPONSIBILITIES PROVIDED BY CONTROLS SUB-CONTRACTOR:

A. Provide to the owner a complete CAD generated point-to-point submittal wiring diagrams and sequences of operation based on the owner's standard. The controls sub-contractor shall include the following information:

1. Location on the drawings of critical control devices such as control panels, auxiliary control panels, static pressure sensors, room temperature sensors, water temperature sensors/wells.
2. Location of all 120/1/60 power sources for the control devices.
3. Control valve sizing (valve CV and pressure drops). Valve schedules.
4. Complete bill of material.
5. Room schedule.
6. Homerun connections between panels.
7. Communication trunk line layout.
8. Lightning protection devices (quantity and location).
9. Surge protection devices (quantity and location).
10. Room temperature sensors
11. Duct temperature sensors
12. Insertion temperature sensors
13. Outside air temperature sensor
14. Pressure sensors (air and water)
23. Differential pressure switches (air and water)
26. Control dampers (installed by sheet metal contractor)
17. Control valves (installed by mechanical contractor)
18. Damper actuators

19. Damper linkages
20. Valve actuators
21. Outboard gear panels (auxiliary panels)
22. Name plates (engraved type)
23. Control relays
24. Varistors
25. Flow meters (installed by the mechanical contractor)
26. Terminal strips
27. Control fuse blocks
28. Power supplies
29. Humidity sensors
30. Transducers
31. Pressure switches
32. End switches
33. Submittal literature on all control devices provided
34. 120/24VAC transformers
35. Warranty
36. Installation of DDC controllers
37. Installation of all electric temperature control devices not in-line
38. Power wiring from junction box at each control panel to power supplies
39. Installation of all power supplies
40. Install all system grounding

- B. The programmable controllers shall be programmed by controls sub-contractor to be compatible with existing software and point naming conventions.

1.6 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR:

- A. Install all in-line control devices (such as valves, dampers, flow meters, water temperature sensors, air flow control devices, wells, flow switches, differential pressure switches across pumps).
- B. Provide operation and maintenance manuals of HVAC equipment purchased.
- C. Start-up and check-out of all HVAC equipment.
- D. Install copper line connections to in-line devices.

1.7 QUALITY ASSURANCE:

- A. All control conduit and wiring shall meet the requirements of Division 26 for materials and installation. All electrical system components shall comply with NEMA and UL standards.
- B. Electrical Standards: Provide electrical components of systems which comply with NEMA and UL standards.
- C. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for control systems.
- D. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

1.8 PRE-INSTALLATION SUBMITTALS:

- A. Submit product data in accordance with the requirements of Section 23010 - Basic Mechanical Requirements, and requirements of Division 1.
- B. Provide complete control diagrams and sequence of operations.
- C. Submit the following product data: manufacturer's detailed information for each piece of equipment used, identifying each item used. Catalog sheets for each item as specified in the control diagrams. Identify specific model and accessories being used in the control diagram, when two or more devices or models are shown.
- D. Provide the following information for each item and device: Proper system label, indication of coordination with submitted catalog information, proper settings and adjustments of instruments, physical dimensions of devices

and accessories, and the normal condition of device, such as normally open or closed dampers, valves, and relays.

- E. Submit automatic control damper information including amount of leakage, airflow characteristics, and construction of all components. Submit a damper and control valve schedule that shall include sizes, locations and pertinent information required for approval and coordination with the mechanical contractor and sheet metal subcontractor.
- F. Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include product data and shop drawings in maintenance manual; in accordance with requirements of Division 1.

1.9 NETWORK AND APPLICATION SPECIFIC CONTROL PANEL SPECIFICATIONS:

- A. The Control System shall be capable of integrating multiple building functions including equipment supervision and control alarm management energy management and historical data collection and archiving.
- B. The facility management system shall consist of the following:
 - 1. Stand-alone DDC panels
 - 2. Stand-alone application specific controllers (ASCs)
 - 3. Integration via Open protocol to 3rd Party equipment to include:
 - 4. Network Handheld Terminals
- C. System architectural design shall eliminate dependence upon any signal device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control alarm management operator I/O and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- D. Stand-alone DDC panels shall be able to access any data from or send control commands and alarm report directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device. Stand-alone DDC panels shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

1.10 NETWORKING / COMMUNICATIONS:

- A. The control system shall have network operator workstations and Stand-alone DDC panels. Inherent in the system's design shall be the ability to expand or modify the network either via the local area network or autodial telephone line modem connections or via a combination of the two networking schemes. The operator workstations shall be located as shown on the drawings.

1.11 LOCAL AREA NETWORK:

- A. Workstation / DDC Panel Support: DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers directly between workstations and between controllers and workstations on a peer-to-peer basis.
- B. Dynamic Data Access: All operator devices and network resident panels shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the local area network. Access to data shall be based upon logical identification of building equipment.
- C. Access to system data shall not be restricted by the hardware configuration of the facility management system. The hardware configuration of the FMS network shall be totally transparent to the user when accessing data or developing control programs.
- D. General Network Design: Network design shall include the following provisions:
- E. High speed data transfer rates for alarm reporting quick report generator from multiple controllers and upload/download efficiency between network devices. The minimum baud rate shall be 1 Megabaud.
 - 1. Support of any combination of controllers directly connected to the local area network. A minimum of 50 devices shall be supported on a single local area network.
 - 2. Detection and accommodation of single or multiple failures of either workstations, DDC panels or the network media. The network shall include provisions for automatically reconfiguring itself to allow all operation equipment to perform their designated functions as effectively as possible in the event of single or multiple failures.
 - a. Message and alarm buffering to prevent information from being lost.

- b. Error detection, correction, and retransmission to guarantee data integrity.
- c. Default device definition to prevent loss of alarms or data, and ensure alarms are reported as quickly as possible in the event an operator device does not respond.
- d. Commonly available, multiple sourced, networking components and protocols shall be used to allow the BAS to coexist with other networking applications such as office automation. Ethernet is the acceptable technology.
- e. Use of an industry standard IEEE 802.x protocol. Communications must be of a deterministic nature to assure calculable performance under worst-case network loading.
- f. Synchronization of the real-time clocks in all DDC panels shall be provided.

1.13 MASTER DDC CONTROL PANEL:

- A. General: Stand-alone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each stand-alone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules. A sufficient number of controllers shall be supplied to fully meet the requirements of this specification and the point list.
- B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases including:
 - 1. Control processes
 - 2. Energy Management applications
 - 3. Alarm Management
 - 4. Historical / Trend Data for all points
 - 5. Maintenance Support applications
 - 6. Custom processes
 - 7. Operator I/O
 - 8. Manual Override monitoring
 - a. Point Types: Each DDC panel shall support the following types of point inputs and outputs:
 - 9. Digital inputs for status/alarm contacts
 - 10. Digital outputs for on/off equipment control
 - 11. Analog inputs for temperature, pressure, humidity, flow, and position measurements
 - 12. Analog outputs for valve and damper position control, and capacity control of primary equipment
 - 13. Pulse inputs for pulsed contact monitoring
- C. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.
- D. Serial Communication Ports: Stand-alone DDC panels shall provide at least two RS serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel-mounted or portable DDC panel operator's terminals. Stand-alone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.
- E. Hardware Override Switches: As indicated in the point schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC panel via local, point discrete, onboard hand/off/auto operator override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.
- F. Hardware Override Monitoring: DDC panels shall monitor the status or position of all overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. DDC panels shall also collect override activity information for daily and monthly reports.
- G. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self- diagnostics, communication diagnosis and diagnosis of all subsidiary equipment. The DDC panel shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each DDC panel, and shall not require the connection of an operator I/O device.
- H. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation

levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

- I. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS.
- J. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

1.14 SYSTEM SOFTWARE FEATURES:

- A. General: All necessary software to form a complete operating system as described in this specification shall be provided. The person machine interface software shall operate on a true Windows based operating system. OS/2, UNIX or any other operating systems shall not be acceptable.
- B. The software programs specified in this section shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

1.23 CONTROL SOFTWARE DESCRIPTION:

- A. Pre-tested Control Algorithms: The DDC panels shall have the ability to perform the following pre-tested control algorithms:
 - 1. Two position control
 - 2. Proportional control
 - 3. Proportional plus integral control
 - 4. Proportional, integral, plus derivative control
 - 5. Automatic control loop tuning
- B. Equipment Cycling Protection: Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.
- C. Heavy Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
- D. Powerfail Motor Restart: Upon the resumption of normal power, the DDC panel shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling, and turn equipment on or off as necessary to resume normal operation.
- E. Energy Management Applications: DDC panels shall have the ability to perform any or all of the following energy management routines:
 - 1. Time of day scheduling
 - 2. Calendar based scheduling
 - 3. Holiday scheduling
 - 4. Temporary schedule overrides
 - 5. Optimal start
 - 6. Optimal stop
 - 7. Night setback control
 - 8. Enthalpy switchover (economizer)
 - 9. Peak demand limiting
 - 10. Temperature compensated load rolling
 - 11. Fans speed / cfm control
 - 12. Heating / Cooling interlock
 - 13. Cold deck reset
 - 14. Hot deck reset

23. Hot water reset
 26. Chilled water reset
 17. Condenser water reset
 18. Chiller sequencing
 19. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow user customization. Programs shall be applied to building equipment as described in the Execution portion of this specification.
- F. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
- G. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:
1. Any system-measured point data or status
 2. Any calculated data
 3. Any results from other processes
 4. User-defined constants
 5. Arithmetic functions (+, -, *, /, square root, exp, etc.)
 6. Boolean logic operators (and, or, exclusive or, etc.)
 7. On-delay / Off-day / One-shot timers
- H. Process Triggers: Custom processes may be triggered based on any combination of the following:
1. Time interval
 2. Time of day
 3. Date
 4. Other processes
 5. Time programming
- I. Events (e.g., point alarms)
- J. Dynamic Data Access: A single process shall be able to incorporate measured or calculated data from any and all other DDC panels on the local area network. In addition, a single process shall be able to issue commands to points in any and all other DDC panels on the local are network.
- K. Advisory / Message Generator: Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device, buffer the information in a follow-up file, or cause the execution of a dial-up connection to a remote device such as a printer or pager.
- L. Custom Process Documentation: The custom control programming feature shall be self-documenting. All interrelationships defined by this feature shall be documented via graphical flowcharts and English language descriptors.
- M. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms form being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC workstation or local I/O device, or communications with other panels on the network.
- N. Point Change Report Description: All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.
- O. Prioritization: The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Each DDC panel shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
- P. The user shall also be able to define under which conditions point changes need to be acknowledged by an operator, and/or sent to follow-up files for retrieval and analysis at a later date.
- Q. Report Routing: Alarm reports, messages, and files will be directed to a user-defined list of operator devices, or PC's used for archiving alarm information. Alarms shall also be automatically directed to a default device in the event a primary device is found to be off-line.

- R. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 65-character alarm message to more fully describe the alarm condition or direct operator response. These alarm messages shall be utilized to perform the beeper interface alarm messaging.
- S. Each stand-alone DDC panel shall be capable of storing a library of at least 250 alarm messages. Each message may be assignable to any number of points in the panel.
- T. Auto-Dial Alarm Management: In Dial-up applications, only critical alarms shall initiate a call to a remote beeper. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time, a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.
- U. Historical Data and Trend Analysis: A variety of historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways.
- V. Continuous Point Histories: Stand-alone DDC panels shall store point history files for all analog and binary inputs and outputs.
- W. The point history routine shall continuously and automatically sample the value of all analog inputs at half-hour intervals. Samples for all point shall be stored for the past 24 hours to allow the user to immediately analyze equipment performance and all problem-related events for the past day. Point history files for binary input or output points and analog output points shall include a continuous record of the last ten status changes or commands for each point. Continuous histories shall be provided on all points.
- X. Control Loop Performance Trends: Stand-alone DDC panels shall also provide high resolution sampling capability with an operator-adjustable resolution of 10-300 seconds in one-second increments for verification of control loop performance.
- Y. Extended Sample Period Trends: Measured and calculated analog and binary data shall also be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 1 minute to 2 hours, in one-minute intervals, shall be provided. Each stand-alone DDC panel shall have a dedicated buffer for trend data, and shall be capable of storing a minimum of 5000 data samples.
- Z. Data Storage and Archiving: Trend data shall be stored at the stand-alone DDC panels, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon either user-defined interval, manual command, or when the trend buffers become full. All trend data shall be available in zip drive form for use in 3rd party personal computer applications.
- AA. Runtime Totalization: Stand-alone DDC panels shall automatically accumulate and store runtime hours for binary input and output points as specified in the Execution portion of this specification
 1. The Totalization routine shall have a sampling resolution of one minute or less.
 2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.
- BB. Analog / Pulse Totalization: Stand-alone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.
 1. Totalization shall provide calculation and storage of accumulations of up to 99,999.9 units (e.g. kWh, gallons, KBTU, tons, etc.).
 2. The Totalization routine shall have a sampling resolution of one minute or less.
 3. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.
- CC. Event Totalization: Stand-alone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event Totalization shall be performed on a daily, weekly, or monthly basis.
 1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.
 2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

1.26 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS:

- A. Each stand-alone DDC controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).
- B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
- C. Each ASC shall have sufficient memory to support its own operating system and data bases, including:
 - 1. Control Processes
 - 2. Energy Management Applications
 - 3. Operator I/O (Portable Service Terminal)
- D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation, or any PC or portable operator's terminal connected to any DDC panel in the network. Provide a portable operator terminal connection to the network at every air handling unit mechanical room. This connection shall allow the operator the capability to access the system information as well as the entire facility. Refer to the specifications on the network terminal below. The network terminal shall operate off of the same passwords as on the workstation.
- E. Application specific controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:
 - 1. Display temperatures
 - 2. Display status
 - 3. Display setpoints
 - 4. Display control parameters
 - 5. Override binary output control
 - 6. Override analog setpoints
 - 7. Modification of gain and offset constants
 - 8. Entire Network Information
- F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be store such that a power failure of any duration does not necessitate reprogramming the controller.

1.17 APPLICATION DESCRIPTIONS:

- A. VV Box Unit Controllers: VV box unit controllers shall support, but not be limited to, the control of the following configurations of VV boxes to address current requirements as described in the Execution portion of this specification, and for future expansion:
 - 1. Single Duct Only
 - 2. Supply / Exhaust
- B. VV box unit controllers shall support the following types of point inputs and outputs:
 - 1. Proportional Cooling Outputs
 - 2. Box Heating Outputs
 - 3. Fan Control Output (On/Off Logic, or Proportional Series Fan Logic)
- C. The modes of operation supported by the VV box unit controllers shall minimally include, but not be limited to, the following:
 - 1. Day/Weekly schedules
 - 2. Comfort/Occupancy mode
 - 3. Economy mode (standby mode, unoccupied, etc.)
 - 4. Temporary Override mode
- D. Occupancy-Based Standby/Comfort Mode Control: Each VV box unit controller shall have a provision for occupancy sensing override. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the VV box unit controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.

- E. Continuous Zone Temperature Histories: Each VV box unit controller shall automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.
- F. Alarm Management: Each VV box unit controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
- G. The controller itself shall consist of 3 individual components; the controller, the actuator / velocity pressure transducer, and the temperature sensor.
- H. Power Failure: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduced the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.
- I. Unitary Controllers: Unitary controllers shall support, but not be limited to, the following types of systems to address specific applications described in the Execution portion of this specification, and for future expansion:
 - 1. Vents (ASHRAE Cycle I, II, III, or W)
 - 2. Pumps
 - 3. Fan Coils (four-pipe)
 - 4. Variable Air Volume Boxes
- J. Unitary controllers shall support the following types of point inputs and outputs:
 - 1. Drybulb
 - 2. Outdoor Air Enthalpy
 - 3. Differential Temperature
 - 4. Binary Input from a separate controller
 - 5. Heating and Cooling Outputs
 - 6. Fan Output, On/Off Logic Control
- K. Unitary controllers shall support the following library of control strategies to address the requirements of the sequences described in the Execution portion of this specification, and for future expansion:
 - 1. Daily/Weekly schedules
 - 2. Comfort/Occupancy mode
 - 3. Standby mode available
 - 4. Unoccupied not available
 - 5. Shutdown
 - 6. Lighting Logic Interlock to Economy Mode
- L. Occupancy-Based Standby / Comfort Mode Control: Each unitary controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the unitary controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.
- M. Continuous Zone Temperature Histories: Each unitary controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance of the past 24 hours. A minimum of two samples per hour shall be stored.
- N. Alarm Management: Each unitary controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
- O. Power Failure: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.

- P. Air Handler Controllers: AH controllers shall support, but not be limited to, the following configurations of systems to address current requirements as described in the Execution portion of this specification, and for future expansion:
1. Large air handlers
 2. Mixed air-single path
 3. Mixed air-dual path
 4. Single path
 5. Dual path
- Q. AH controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand-alone fashion.
- R. AH controllers shall have a library of control routines and program logic to perform the sequence of operation as specified in the Execution portion of this specification.
- S. Occupancy-Based Standby / Comfort Mode Control: Each AH controller shall have a provision of occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device, the AH controller shall automatically select either Standby or Comfort mode to minimize the heating and cooling requirements while satisfying comfort conditions.
- T. Continuous Zone Temperature Histories: Each AH controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be store.
- U. Alarm Management: Each AH controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
- V. Power Failure: In the event of the loss of normal power there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data. Battery back-up of the controller configuration shall not be permitted. Regardless of your approval as a manufacturer, in the event that the stand-alone controllers maintain their programs via batteries, this shall not be acceptable. This removes the need for emergency power to the controllers and reduces the battery back-up requirements. Programs shall be maintained in non-volatile EEPROMS only.
- W. Open Protocol Application Controller: The BAS shall support open-protocol communications with other vendors equipment to minimize redundant automation networks with the facility and eliminate multiple user interfaces. Connectivity to third party controllers shall be through integrator panels that reside on the BAS network and have down-loadable drivers for accommodation of a specific equipment manufacturers protocol. Interfaces shall be required for the items described in the General Products description of this section. Hardwired interfaces or non-factory supported software gateways shall not be acceptable.
- 1.18 POINTS LIST SUMMARY AND AS SHOWN ON THE DRAWINGS:
- A. Chillers:
1. Water setpoint
 2. Water control point
 3. Entering chilled water
 4. Leaving chilled water
 5. Entering condenser water
 6. Leaving condenser water
 7. Evaporator refrigerant temperature
 8. Evaporator pressure
 9. Condenser refrigerant temperature
 10. Condenser pressure
 11. Discharge temperature
 12. Bearing temperature
 13. Motor winding temperature
 14. Oil sump temperature
 15. Oil pressure transducer

16. Oil differential pressure
17. Base demand limit
18. Active demand limit
19. Line voltage percent
20. Line voltage actual
21. Compressor motor load
22. Compressor motor current
23. Compressor motor amps
24. Target Vane position
25. Actual van position
26. Total compressor starts
27. Starts in 12 hours
28. Compressor ontime
29. Service ontime
30. Compressor motor kW
31. Demand limit 4-20 mA
32. Temperature Reset 4-20 mA
33. Common CHWS sensor
34. Common CHWR sensor
35. Occupied 0-no, 1-yes
36. Alarm state 0-ok, 1-alarm
37. Chiller start/stop 0-stop, 1-start
38. Hot gas bypass relay 0-no, 1-yes
39. Chilled water pump 0-no, 1-yes
40. Chilled water flow 0-no, 1-yes
41. Condenser water pump 0-no, 1-yes
42. Condenser water flow 0-no, 1-yes
43. Compressor start relay 0-no, 1-yes
44. Compressor start contact 0-no, 1-yes
45. Compressor run contact 0-no, 1-yes
46. Starter Fault contract 0-no, 1-yes
47. Pressure trip contact 0-no, 1-yes
48. Single cycle dropout 0-no, 1-yes
49. Oil pump relay 0-no, 1-yes
50. Oil heater relay 0-no, 1-yes
51. Motor cooling relay 0-no, 1-yes
52. Tower fan relay 0-no, 1-yes
53. Compressor shunt trip relay 0-no, 1-yes
54. Alarm relay 0-no, 1-yes
55. Remote contacts input 0-no, 1-yes

1.19 OPERATOR INTERFACE:

- A. Basic Interface Description: Command entry/menu selection process; operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software.
- B. The operator interface shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device, and "point and click" approach to menu selection. Users shall be able to start and stop equipment or change setpoints from graphical displays through the use of a mouse or similar pointing device.

- C. Graphical and Text-Based Displays: At the option of the user, operator workstations shall provide consistent graphical or text-base displays of all system point and application data described in this specification. Point identification, engineering units, status indication, and application naming conventions shall be the same at all workstations.
- D. Password Protection: Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.
- E. Passwords shall be exactly the same for all operator devices, including portable or panel-mounted network terminals. Any additions or changes made to password definition shall automatically cause passwords at all DDC panels on a network to be updated and downloaded to minimize the task of maintaining system security. Users shall not be required to update passwords for DDC panels individually.
 - 1. A minimum of five levels of access shall be supported.
 - a. Level 1 - Data access and display
 - b. Level 2 = Level 1 + Operator Overrides
 - c. Level 3 = Level 2 + Database Modification
 - d. Level 4 = Level 3 + Database Generation
 - e. Level 5 = Level 4 + Password Add/Modification
 - 2. A minimum of 20 passwords shall be supported at each DDC panel.
- F. Operators will be able to perform only those commands available for their respective passwords. Menu selections display at any operator device, including portable or panel- mounted devices, shall be limited to only those items defined for the access level of the password used to log on.
- G. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices on-line.
- H. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:
 - 1. Start-up or shutdown selected equipment
 - 2. Adjust setpoints
 - 3. Add/Modify/Delete time programming
 - 4. Enable/Disable process execution
 - 5. Lock/Unlock alarm reporting for each point
 - 6. Enable/Disable Totalization for each point
 - 7. Enable/Diable Trending for each point
 - 8. Override PID Loop setpoints
 - 9. Enter temporary override schedules
 - 10. Define Holiday schedules
 - 11. Change time/date
 - 12. Enter/Modify analog alarm limits
 - 13. Enter/Modify analog warning limits
 - 14. View limits
 - 15. Enable/Disable Demand Limiting for each meter
 - 16. Enable/Disable Duty Cycle for each load
- I. Logs and Summaries: Reports shall be generated automatically or manually, and directed to either LCD displays, printers, or disk files. As a minimum, the system shall allow the user to easily obtain the following types of reports:
 - 1. A general listing of all points in the network
 - a. List all points currently in alarm
 - b. List of all off-line points
 - c. List all points currently in override status
 - d. List of all disable points
 - e. List all points currently locked out

- f. List of all items defined in a "follow-up" file
 - g. List all weekly schedules
 - h. List all holiday programming
 - i. List of limits and deadbands
2. Operator transaction file to include person and action performed.
- J. Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the facility management system. Under no conditions shall the operators need to specify the address of hardware controller to obtain system information.
- K. System Configuration and Definition: All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.
- L. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:
1. Add / Delete / Modify Stand-alone DDC Panels
 2. Add / Delete / Modify Operator Workstations
 3. Add / Delete / Modify Application Specific Controllers
 4. Add / Delete / Modify points of any type, and all associated point parameters, and tuning constants
 5. Add / Delete / Modify alarm reporting definition for each point
 6. Add / Delete / Modify control loops
 7. Add / Delete / Modify energy management applications
 8. Add / Delete / Modify time and calendar based programming
 9. Add / Delete / Modify Totalization for every point
 10. Add / Delete / Modify Historical Data Trending for every point
 11. Add / Delete / Modify custom control processes
 12. Add / Delete / Modify dial-up telecommunication definition
 13. Add / Delete / Modify all operator passwords
 14. Add / Delete / Modify alarm messages
- M. Programming Description: Definition of operator device characteristics, DDC panels, individual points, applications, and control sequences shall be performed through fill-in-the- blank templates and graphical programming approach.
- N. Graphical programming shall allow the user to define the software configuration of DDC control logic for HVAC system control sequences, fan interlocks, pump interlocks, PID control loops, and other control relationships through the creation of graphical logic flow diagrams.
- O. Graphical Programming: Control sequences are created by using a mouse input device to draw interconnecting lines between symbols depicting inputs, operators, (comparisons and mathematical calculations), and outputs of a control sequence. As a minimum, graphic symbols shall be used represent:
1. Process inputs, such as temperature, humidity, or pressure values, status, time, date, or any other measured or calculated system data.
 2. Mathematical process operators, such as addition, subtraction, multiplication, or greater than, equal to, less than, etc.
 3. Logical process operators such as and, or, exclusive or, not, etc. time delays.
 4. Process control outputs such as start/stop control point, analog adjust points, etc.
 5. Process calculation outputs
 6. Text file outputs and advisories
- P. Network-Wide Strategy Development: Inputs and outputs for any process shall not be restricted to a single DDC panel, but shall be able to include data from any and all other DDC panels to allow the development of network-wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).
- Q. Sequence Testing and Simulation: A software tools shall be provided, which allows a user to simulate control sequence execution to test strategies before they are actually applied to mechanical systems. Users shall be

able to enter hypothetical input data, and verify desired control response and calculation results via graphical displays and hard copy printouts.

- R. System Definition / Control Sequence Documentation: All portions of system definition shall be self-documenting to provide hard copy printouts of all configuration and application data. Control process and DDC control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequences to be easily interpreted and modified at any time in the future.
- S. Database Save / Restore / Back-up: Back-up copies of all stand-alone DDC panel databases shall be stored in at least one personal computer workstation.
- T. Continuous supervision of the integrity of all DDC panel data bases shall be provided. In the event that any DDC panel on the network experiences a loss of its data base for any reason, the system shall automatically download a new copy of the respective data base to restore proper operation. Data base back-up / download shall occur over the local area network without operator intervention. User shall also have the ability to manually execute downloads of any or all portions of a DDC panel's data base.
- U. The DDC panel operator terminal shall simultaneously display a minimum of 6 points with full English identification to allow an operator to view single screen dynamic displays depicting entire mechanical systems.
- V. The operator functions provided by the DDC panel operator terminal shall include, but not be limited to, the following: As the system is distributed, the information shall be available from any single location of the entire network.
 - 1. Start and stop points
 - 2. Modify setpoints
 - 3. Modify PID loop setpoints
 - 4. Override PID control
 - 5. Change time/date
 - 6. Add / Modify Start / Stop weekly scheduling
 - 7. Add / Modify setpoint weekly scheduling
 - 8. Enter temporary override schedules
 - 9. Define holiday schedules
 - 10. View analog limits
 - 11. Enter / Modify analog warning limits
 - 12. Enter / Modify analog alarm limits
 - 13. Enter / Modify analog differentials
 - 14. View point history files

1.20 DELIVERY, STORAGE AND HANDLING:

- A. Provide factory shipping cartons for each piece of equipment and control device. Maintain cartons while shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

1.21 RECORD DOCUMENTS:

- A. Provide operation and maintenance manuals.
- B. Furnish and install plastic encased charts and flow diagrams in each equipment room.
- C. One copy of the control system record drawings, submitted as part of the project close-out package. Submission shall be in AutoCAD and PDF format on disk and 3 hard copies, to include the following information:
 - 1. Point-to-point wiring diagrams and sequences of operation
 - 2. Location on the drawings of critical control devices such as control panels, auxiliary control panels, static pressure sensors, room temperature sensors, water temperature sensors/wells.
 - 3. Location of all 120/1/60 power sources for the control devices.
 - 4. Control valve sizing (valve CV and pressure drops). Valve schedules.
 - 5. Complete bill of material.
 - 6. Room schedule.

7. Phone line or internet location for remote system access.
8. Homerun connections between panels.
9. Communication trunk line layouts.
10. Lightning protection devices (quantity and location).
11. Surge protection devices (quantity and location).

1.22 WARRANTY:

- A. Provide full parts and labor warranty on all control devices, panels, and wiring installed during this project for one (1) year from the date of substantial acceptance of the project.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. Low Temperature Detector: Provide manually reset freezestats on outside air AH's with a minimum of 20 foot vapor tension element. Interlock to AH starter to shut unit off in either hand or auto position. .
- B. Static Pressure Transmitters: Provide electronic supply duct static pressure transmitter as required. Transmitter shall sense the differential between the supply duct and the space pressure. Sensing point shall be located 2/3 downstream in the longest ductwork run. Output shall be 4-20 mA proportional to pressure increase. Accuracy to be $\pm 2\%$ of full range.
- C. Water Flow Measurement: The sensor shall be a 4-20 mA output type, with the repeatability of $\pm .1\%$ of value. Shall incorporate back-lit display and keypad on the meter. Flowmeter shall utilize Vortex shedding technology with a turndown of 20:1. Temperature limits: -40.0Ø to 80.0ØC . Material is dependent upon that of the size and type of pipe material. Manufacturer: Yokogawa Yewflow Vortex Flowmeter.
- D. Control Valves Normally Open Two-Way and Three-Way Control Valves: Provide fully proportioning two-way control valves with equal percentage modulating plugs for normally open applications. Valves shall be sized for 3 to 5 psi pressure flow at maximum flow rate. Valves shall have stainless steel stems and spring-loaded Teflon packing. Leakage shall not exceed 0.05 percent of valve CV. Utilize existing pneumatic valves where possible otherwise. Use electric with manual override capability.
 1. Up to 2 Inch: Valves shall be cast brass, screwed ends, ANSI Class 125.
 2. 2½ to 6 Inch: Valves to be cast iron, flanged ends, ANSI Class 125.
- J. Manufacturers: KMC.
- K. Butterfly Valves: Provide two-way butterfly valves rated per ANSI 230 with fully tapped and threaded lugs and carbon steel body. Valves shall have field replaceable elastomer resilient seats. Disc shall be fabricated from aluminum or manganese bronze and shaft shall be 426, 326 or 17-4PH stainless steel. Manufacturer: Bray Valves or Keystone.
- L. Control Dampers: Provide automatic control dampers. Installation by Division 23 contractor per specification section "Ductwork Specialties". Provide damper for low leakage, parallel blade type. Blades to be a minimum 26 gauge galvanized steel of single unit design or 22 gauge galvanized sheet steel of double unit construction. Damper blades shall be 6 inches wide and a maximum length of 60 inches with square block pins of zinc-plated steel. Frames shall be 13 gauge galvanized sheet metal with non-ferrous sleeve type bearings. Dampers shall have solid stops with edge seals so that the blade edges shall interlock with neoprene seals. Leakage shall not exceed 6.3 cfm per square foot with the damper closed against 4 inches w.g. static pressure.

2.2 CURRENT TRANSFORMERS:

- A. Current transformers shall be Independent Transformer model 500 or 600 or approved equal.

2.3 CURRENT TRANSDUCER:

- A. Current transducer shall be Kele model 4CTV or approved equal.

2.4 CONTROL CONDUCTORS AND CONDUIT:

- A. Provide control conductors that meet the BAS manufacturer's requirements and by control diagrams, not less than number 18 AWG stranded copper for all digital signal / control and not less than 18 AWG stranded and

shielded copper conductors between controllers. Provide MTW controls conductors within enclosures and number 12 AWG stranded copper (minimum) THHN or THWN power conductors.

- B. In unburied indoor concealed locations, provide EMT conduit with compression type fittings in normally cooled / conditioned spaces. Provide aluminum IMC with cast type aluminum screwed fittings in non-cooled / conditioned spaces, including mechanical rooms. Plenum rated cable may be used in plenums only.
- C. In unburied outdoor locations, provide weather-tight galvanized steel IMC with cast type galvanized screwed fittings. Provide liquid-tight flexible metallic conduit (18 inches minimum length, 6 feet maximum) for connections to all vibrating equipment. Provide insulated grounding bushings at conduit connections to all boxes and panels. Seal water-tight all conduit penetrations.
- D. Conduit buried outdoors and below slabs shall be PVC, in accordance with Division 26 of the specifications.
- E. Provide UL approved components and located for accessibility to NEC requirements. Plenum cable on separate supports mounted on vertical walls of the plenum shall be acceptable, provided it is tagged and bundled. Plenum cables where exposed or in walls shall be in Flex, EMT, or Wiremold per NEC. Plenum cable bundles shall not be supported from ductwork or pipes.
- F. All control wiring, whether in conduit or bare, shall be home runs without splices.
- G. Conduit Markings: In the mechanical rooms and any other location where the conduit is exposed, mark junction boxes to identify controls conduit.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the engineer.

3.2 INSTALLATION OF CONTROL SYSTEMS:

- A. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
- B. The control equipment and connecting wiring shall be installed in a neat and workman-line manner by trained mechanics on staff and under direct supervision of the controls sub-contractor, conforming to all applicable state and local codes.
- C. Provide all communications accessories for an operable energy management/direct digital control system.
- D. Provide all components, accessories, installation adjustment and testing necessary for an operational system.
- E. Provide temperature and humidity sensors, automatic water valves with actuators, control wiring, panels, and other auxiliaries and appurtenances necessary to obtain satisfactory control of mechanical systems and as specified in the control diagrams. Coordinate with Air Distribution System installer for control air requirements. Provide electronic system components necessary to accomplish the automatic control requirements of the mechanical work.
- F. Provide conductors and conduit for control systems. Installation shall meet requirements of Division 26.
- G. Coordinate and work with Test and Balance Agency to insure proper system adjustments of all control components and control devices such as dampers, valves, etc. Provide the necessary assistance labor to the Test and Balance agency during start-up and check-out periods.
- H. All panels shall be installed in accessible locations, free of obstructions from pipes, conduits, ductwork, etc. Unless otherwise shown on contract documents all panels shall be reached from the floor without the use of ladders. Panels that are found to be in violation of these requirements shall be relocated at no cost to the owner.

3.3 LIGHTNING & ELECTROMAGNETIC SUPPRESSION:

- A. All interbuilding (building to building) communications shall be over 62/125 X EE-6 meter wavelength fiber installed by Division 26. Fiber optic transceivers shall be provided by the Controls Installer. Fiber patch panel at hub locations to be provided by Division 26.

- B. For protection of the Hayes 1200 Baud Modem Telephone, incorporate a Surge Protector Model PDS-11-Electronic Specialists, Natick, Massachusetts 01760.

3.4 CONTROL WIRING:

- A. Install control wiring, without splices between terminal points, color coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.
- B. All wiring and piping shall be run straight, parallel to building lines and structure. All wires shall be bundled and independently supported when not in conduit. Flexible wireways shall be limited to six feet long. Reroute wires as directed by engineer when not in compliance with this paragraph.
- C. All control points shall be homeruns with no splices and as shown on the control diagrams.
- D. All control point wiring shall land at the controller end on a terminal strip, either a separate strip or the I/O strip.
- E. Splices shall not be permitted in wireways or AUX cabinets.
- F. Wiring shall conform to the manufacturers recommend installation practices including transient suppression on I/O circuit.
- G. Wiring shall be labeled to match the control shop drawings.
- H. Electrical contractor will provide a 120 VAC junction box at each DDC panel. Controls sub-contractor shall provide all other necessary power and control wiring to all control devices including valves, dampers, variable air volume terminals, and wiring to damper operators, valves, etc.
- I. Provide communications accessories for an operable energy management/direct digital control system.
- J. Coordinate input and output requirements between controller and remote devices/sensors.
- K. Coordinate and work with the general contractor and Test and Balance Agency to insure proper system adjustments of all control components and control devices, such as dampers, valves, etc.
- L. Secure controls conduit to building structure. Do not substitute attachments to work of other trades (such as pipes, ducts, other conduits). Provide accessory steel supports, as required. Refer to Division 26 specifications and details for methods of neat and secure support of cables and conduit.
- M. Locate control instruments or accessories on insulated/covered casings/pipes/ducts on the finished surfaces of the covering. Seal penetrations to assure no leaks are present around stems that penetrate into the air or water systems.
- N. Provide thermowells for all pipe mounted sensors.
- O. Identification: Provide engraved laminated plates and valve disks for identification of each: control valve, controls damper, controls panel, flow sensor, display gauge, and sensor (not internal panel gauges). Label all nonpanel devices (as well as instruments mounted in face of panels) to indicate system function.
- P. Provide a room temperature sensor for each occupied space and as indicated on the drawings.
- Q. Provide CT's on all chiller power supplies and provide monitoring of current (power) use.

3.5 TESTS:

- A. Test piping during and after installation.

END OF SECTION 23 09 00

SECTION 23 10 60 - PIPES & PIPE FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to pipes and pipe fittings specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division 15 sections.
- B. Type of pipes and pipe fittings specified in this section include the following:
 - 1. Steel Pipes.
 - 2. Copper Tube.
 - 4. Plastic Pipes.
 - 5. Miscellaneous Piping Materials/Products.
- C. Pipes and pipe fittings furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 15 sections.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

- A. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
 - 1. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).
- B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
- C. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

1.5 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.
- B. Welding Certifications: Submit reports as required for piping work.
- C. Brazing Certifications: Submit reports as required for piping work.
- D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL:

- A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.
- B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS:

- A. Black Steel Pipe: ASTM A53, A106 or A120; except comply with ASTM A53 or A106 where close coiling or bending is required.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3.
- C. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass).
- D. Threaded Pipe Plugs: ANSI B16.14.
- E. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
 - 1. Material Group: Group 1.1.
 - 2. End Connections: Buttwelding.
 - 3. Facings: Raised-face.
- F. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.
- G. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/2", and do not thread nipples full length (no close-nipples).

2.3 COPPER TUBE AND FITTINGS:

- A. Copper Tube: ASTM B88; type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.
- B. Cast-Copper Solder-Joint Fittings: ANSI B16.18.
- C. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
- D. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

2.4 PLASTIC PIPES AND PIPE FITTINGS:

- A. Polyvinyl Chloride Pipe (PVC): ASTM D1785.
- B. Polyvinyl Chloride Drain, Waste, and Vent Pipe (PVC): ASTM D2665.
- C. Chlorinated Polyvinyl Chloride Pipe (CPVC): ASTM F441.

D. PVC Fittings:

1. Schedule 40 Socket: ASTM D2466.
2. Schedule 80 Socket: ASTM D2467.
3. Schedule 80 Threaded: ASTM D2464.
4. DWV Socket: ASTM D2665.
5. Sewer Socket: ASTM D2729.
6. Solvent Cement: ASTM D2564.
7. Solvent Cement (To Join PVC to ABS): ASTM D3138.

2.5 GROOVED PIPING PRODUCTS:

- A. General: As Installer's option, mechanical grooved pipe couplings and fittings may be used for piping systems in mechanical equipment rooms having operating conditions not exceeding 230°F (110°C), excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.
- B. Coupling Housings: Malleable iron conforming to ASTM A47 or ductile iron conforming to ASTM A536.
- C. Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.
- D. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D2000.
- E. Bolts and Nuts: Heat-treated carbon steel, ASTM A183, minimum tensile 110,000 psi.
- F. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.
- G. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.
- H. Malleable Iron: ASTM A47.
- I. Ductile Iron: ASTM A536.
- J. Fabricated Steel: ASTM A53, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20".
- K. Steel: ASTM A234.
- L. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt hole alignment.
- M. Malleable Iron: ASTM A47.
- N. Ductile Iron: ASTM A536.
- O. Grooves: Conform to the following:
 1. Standard Steel: Square cut.
- P. Manufacturer: Subject to compliance with requirements, provide grooved piping products of one of the following:
 1. ITT Grinnell Corp.
 2. Stockham Valves & Fittings, Inc.
 3. Victaulic Co. of America.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:

- A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements.
- B. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

- C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements.
- D. Tin-Antimony Solder: ASTM B32, Grade 95TA.
- E. Gaskets for Flanged Joints: ANSI B16.21; full-faces for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.
- F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
- G. Manufacturer: Subject to compliance with requirements, provide piping connectors of the following:
 - 1. Fernco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.
- B. Comply with ANSI B31 Code for Pressure Piping.
- C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- D. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures.

3.2 PIPING SYSTEM JOINTS:

- A. General: Provide joints of type indicated in each piping system.
- B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- C. Solder copper tube-and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- D. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.
- E. Weld pipe joints only when ambient temperature is above 0oF (-18oC) where possible.
- F. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
- G. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".

- H. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
- I. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
- J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
- K. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.
- L. Making Solvent-Cemented Joints: ASTM D2235, and ASTM F402.
- M. Grooved Pipe Joints: Comply with fitting manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions.

3.3 CLEANING, FLUSHING, INSPECTING:

- A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
- B. Inspect pressure piping in accordance with procedures of ASME B31.
- C. Disinfect water service piping in accordance with AWWA C601.

3.4 PIPING TESTS:

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
- C. Required test period is 2 hours.
- D. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.
- E. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- G. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 23 10 60

SECTION 23 11 19 - PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-15 Basic Mechanical Materials and Methods section, and is part of each Division-15 section making reference to piping specialties specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of piping specialties work required by this section is indicated on drawings and schedules and by requirements of this section.
- B. Types of piping specialties specified in this section include the following:
 - 1. Pipe Escutcheons
 - 2. Pipeline Strainers
 - 3. Vandal-Proof Vent Caps
 - 4. Dielectric Unions
 - 5. Mechanical Sleeve Seals
 - 6. Fire Barrier Penetration Seals
 - 7. Water Hammer Arresters
 - 8. Drip Pans
 - 9. Pipe Sleeves
 - 10. Sleeve Seals
- C. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-15 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 CODES AND STANDARDS:

- A. FCI Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1 "Pressure Rating Standard for "Y" Type Strainers". Test and rate other type strainers in accordance with FCI 78-1 "Pressure Rating Standard for Pipeline Strainers Other than "Y" Type".

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
- B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.
- C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 PIPE ESCUTCHEONS

- A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside the pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- D. Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following:
 - 1. Chicago Specialty Mfg. Co.
 - 2. Producers Specialty & Mfg. Corp.
 - 3. Sanitary-Dash Mfg. Co.

2.3 LOW PRESSURE Y-TYPE PIPELINE STRAINERS:

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens with 3/64" perforations @ 233 per sq.in.
 - 1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 4. Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 5. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.
- B. Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following:
 - 1. Armstrong Machine Works.
 - 2. Hoffman Specialty ITT; Fluid Handling Div.
 - 3. Metraflex Co.
 - 4. R-P&C Valve; Div. White Consolidated Industries, Inc.
 - 5. Spirax Sarco.
 - 6. Trane Co.
 - 7. Victaulic Co. of America.
 - 8. Watts Regulator Co.

2.4 HIGH PRESSURE Y-TYPE PIPELINE STRAINERS

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 250 psi working pressure, with Type 304 stainless steel screens, with 3/64" perforations @ 233 per sq.in.
 - 1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted steel retainer with off-center blowdown fitted with pipe plug.
 - 4. Butt Welded Ends, 2-1/2" and Larger: Schedule 80 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
- B. Manufacturer: Subject to compliance with requirements, provide high pressure Y-type strainers of one of the following:
 - 1. Armstrong Machine Works.
 - 2. Hoffman Specialty ITT; Fluid Handling Div.
 - 3. Metraflex Co.
 - 4. R-P&C Valve; Div. White Consolidated Industries, Inc.
 - 5. Spirax Sarco.
 - 6. Trane Co.
 - 7. Watts Regulator Co.

2.5 VANDAL-PROOF VENT CAPS:

- A. General: Provide cast-iron vandal-proof vent caps, full size of base for steel pipes.
- B. Manufacturer: Subject to compliance with requirements, provide vandal-proof vent caps of one of the following:
 - 1. Josam Mfg. Co.
 - 2. Smith (Jay R.) Mfg. Co.
 - 3. Tyler Pipe; Sub. of Tyler Corp.
 - 4. Zurn Industries, Inc.; Hydromechanics Div.

2.6 DIELECTRIC UNIONS

- A. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.
- B. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:
 - 1. B & K Industries, Inc.
 - 2. Capital Mfg. Co.; Div. of Harsco Corp.
 - 3. Eclipse, Inc.
 - 4. Epco Sales, Inc.
 - 5. Perfection Corp.
 - 6. Rockford-Eclipse Div.

2.7 MECHANICAL SLEEVE SEALS

- A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- B. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following:

1. Thunderline Corp.

2.8 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or duct work. Refer to plumbing drawings for fire barrier penetration details.
- B. Cracks, Voids, or Holes Up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.
- C. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F (121 to 177°C), UL-listed.
- D. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:
 - 1. Electro Products Div./3M.
 - 2. Nelson; Unit of General Signal.

2.9 WATER HAMMER ARRESTERS:

- A. General: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
- B. Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following:
 - 1. Amtrol, Inc.
 - 2. Smith (Jay R.) Mfg. Co.
 - 3. Tyler Pipe; Sub. of Tyler Corp.
 - 4. Zurn Industries, Inc.; Hydromechanics Div.

2.10 FABRICATED PIPING SPECIALTIES:

- A. Drip Pans: Provide drip pans fabricated from stainless sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
- B. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from stainless steel sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricated from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.
 - 2. Steel-Pipe: Fabricate from Schedule 40 stainless steel pipe; remove burrs.
 - 3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 - 4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
 - 1. Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual

terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
 - a. Pumps
 - b. Steam traps serving steam main drips
 - c. Temperature control valves
 - d. Pressure reducing valves
 - e. Temperature or pressure regulating valves

- C. Vandal-Proof Vent Caps: Install vandal-proof vent caps on each vent pipe passing through roof, and elsewhere as indicated. Locate base of vent cap 6" above roof surface, or higher where required by Code.
- D. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- E. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- F. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.
- G. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.2 INSTALLATION OF FABRICATED PIPING SPECIALTIES:

- A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
- B. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
 1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
 2. Install iron-pipe sleeves at exterior penetrations; both above and below grade.
 3. Install steel-pipe or plastic-pipe sleeves except as otherwise indicated.
- C. Sleeve Seals: Install in accordance with the following:
 1. Link-Seal or equivalent: Fill and pack annular space between sleeve and pipe with Link-Seal Modular Seals, Model "C" or equivalent.

END OF SECTION 23 11 19

SECTION 23 23 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of hydronic piping work is indicated on drawings and schedules, and by requirements of this section.
- B. Refer to other Division-23 sections for hydronic specialties; not work of this section.
- C. Refer to other Division-23 sections for HVAC pumps; not work of this section.
- D. Refer to other Division-23 sections for testing, adjusting, and balancing of hydronic piping systems; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of hydronic piping products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with hydronic piping work similar to that required for project.
- C. Codes and Standards:
 - 1. ASME Compliance: Fabricate and install hydronic piping in accordance with ASME B31.9 "Building Services Piping".
 - 2. Florida Building Code-Mechanical, 2017.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for hydronic piping materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed hydronic piping and piping products, in accordance with requirements of Division 1.
- C. Maintenance Data: Submit maintenance data and parts lists for hydronic piping materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on hydronic piping systems maximum design pressures. Provide sizes and type matching piping and equipment connections; provide fittings of materials which match pipe materials used in hydronic piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:

- A. General: Provide identification complying with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
 - 1. Hydronic Piping: Plastic pipe markers.
 - 2. Hydronic Valves: Brass valve tags.

2.3 BASIC PIPES AND PIPE FITTINGS:

- A. General: Provide pipes and pipe fittings complying with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Hydronic Piping:
 - 1. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; Class 125 cast-iron fittings with threaded joints.
 - 2. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings with welded joints.
 - 3. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; grooved fittings with mechanical grooved couplings in mechanical rooms only.

2.4 BASIC PIPING SPECIALTIES:

- A. General: Provide piping specialties complying with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
 - 1. Pipe escutcheons.
 - 2. Pipeline strainers.
 - 3. Dielectric unions.
 - 4. Sleeves.
 - 5. Sleeve seals.

2.5 BASIC SUPPORTS AND ANCHORS:

- A. General: Provide supports and anchors complying with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
 - 1. Adjustable steel clevises, adjustable pipe saddle supports, single pipe rolls, and adjustable roller hangers, for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical-piping clamps.
 - 3. Steel turnbuckles, for hanger-rod attachments.
 - 4. Concrete inserts, C-clamps, malleable beam clamps, and steel brackets, for building attachments.
 - 5. Protection saddles, for saddles and shields.

2.6 BASIC VALVES:

- A. General: Provide valves complying with Division-23 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:
- B. Sectional Valves:
 - 1. 2" and Smaller: Ball valves.
 - 2. 2-1/2" and Larger: Butterfly valves.
- C. Shutoff Valves:
 - 1. 2" and Smaller: Gate valves.
 - 2. 2" and Smaller: Ball valves.
 - 3. 2-1/2" and Larger: Gate valves.
- D. Heating/Cooling Terminal Outlet Valves:
 - 1. 2" and Smaller: Ball valves and balance cocks.

2. 2" and Smaller: Balance valves.
3. 2-1/2" and Larger: Gate valves and balance cocks.

E. Drain Valves:

1. 2" and Smaller: Ball valves.

F. Check Valves:

1. All Sizes: Swing check valves.

2.7 BASIC METERS AND GAGES:

A. General: Provide meters and gages complying with Division-23 Basic Mechanical Materials and Methods section "Meters and Gages", in accordance with the following listing:

1. Thermometers and fittings.
2. Pressure gages and fittings.
3. Flow measuring meters.

2.8 BASIC VIBRATION CONTROL:

A. General: Provide vibration control products complying with Division-23 Basic Mechanical Materials and Methods section "Mechanical Requirements", in accordance with the following listing:

1. Flexible pipe connectors.

2.9 PRE-INSULATED WELDED STEEL PIPING SYSTEM

A. Piping: At the installer's option, steel pre-insulated pipe shall be used for underground chilled water service. The pipe sections shall be welded. Unless otherwise specified, all pipe, fittings, valves, and accessories shall conform to the requirements of ANSI B31.1 and shall be of the proper type for the pressure and temperature of the service.

B. Steel Carrier Pipe and Fittings:

1. Carrier pipe shall be black steel pipe conforming to ASTM A53 ERW Schedule 40 Grade B. The spigot ends shall be beveled for welding.
2. Fittings shall be preinsulated. Fittings shall be pre-insulated by the pipe manufacturer using the same insulation thickness and casing as the pipe. Where necessary laid-up fiberglass casing may be substituted on all or part of the fitting and shall structurally match the casing of the pipe. An anchor plate of the proper size shall be provided when required by the design and shall be an integral part of the fitting. Field applied anchor plates shall not be allowed except by special approval of the engineer. End seals on fittings shall be the same as used on the pipe.

C. Casing (jacket) Pipe shall be PVC or HDPE. The casing, in combination with the foam system, is suitable for H-20 highway loading with two feet of cover providing the pipe bedding and backfill material are properly placed and compacted to H-20 specifications. The casing shall be based on one of the following:

1. PVC Casing pipe for the pre-insulated pipe system shall be Schedule 40 PVC pipe. Pipe of virgin PVC resin meeting the minimum classification requirements of ASTM D 1784, Class 12454-B and has a minimum thickness of 60 mils. The sleeve thickness shall be compatible with and overlap the casing pipe. The following standard 80 lb casing thicknesses may be used as a guide:

Carrier Pipe Size	Casing Thickness
1.5"	.14"
2"	.14"
2.5"	.12"
3"	.12"
4"	.16"
5"	.16"

6"	.20"
8"	.24"
10"	.28"
12"	.25"
14"	.37"
16"	.43"
18"	.43"
20"	.48"
24"	.55"

For other thicknesses, consult the manufacturer.

2. HDPE Casing pipe for the pre-insulated system shall be extruded, black, high density polyethylene (HDPE) having a wall thickness not less than 125 mils for pipe sizes less than or equal to 12", 230 mils for jacket sizes 12" and larger.
- D. Straight run joints shall be field insulated per the manufacturer's instructions, using PVC or HDPE sleeve, polyurethane foam, and pressure sensitive polyethylene backed, high temperature tape, 30 mils thick, or heat shrink wrap.
- E. Fittings shall be factory prefabricated and preinsulated with polyurethane foam to the thickness specified and jacketed with a PVC or molded HDPE fitting cover. Fittings include elbows, tees, reducers and anchors.
- F. End Seals: End seals for pre-insulated steel pipe shall be certified to resist infiltration of water at 20 feet of head at the intended operating temperature. Mastic end seals which may meet the requirements of the 20 ft test shall not be allowed.
- G. Insulation: Insulation shall be polyurethane foam.
1. Polyurethane foam insulation shall meet the following specifications:

Type:	Two component urethane
Compressive Strength:	35 psi parallel min at 5% Comp
Shrinkage:	None at 70 °F
Free Rise Density:	2.0 to 3.0 lbs/cubic foot
Aged "K" (70 F - 72 hrs)	0.140 BTU-in/hr-sf-°F
Closed Cell Content:	90%
 2.

Carrier Pipe Size	Insulation Thickness
1.5"	1.16"
2"	0.92"
2.5"	1.51"
3"	1.20"
4"	1.67"
5"	1.14"
6"	1.59"
8"	1.57"
10"	1.49"
12"	1.38"
14"	1.98"
16"	2.59"
18"	1.60"

20"	1.92"
24"	1.43"

3. Insulation concentricity: Carrier pipe shall be concentric to casing pipe. The allowable maximum deviation from center line of carrier pipe shall be plus or minus 1/4 inch at the casing center point and plus or minus 1/16 inch at the end seals.
- H. Manufacturer: Subject to compliance with requirements, provide preinsulated piping system of one of the following:
 1. Thermacor Process
 2. Thermal Pipe Systems.
 3. Or Engineer's approved equal.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. General: Examine areas and conditions under which hydronic piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:

- A. General: Install mechanical identification in accordance with Division-23 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF HYDRONIC PIPING:

- A. General: Install hydronic piping in accordance with Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Install eccentric reducers where pipe is reduced in size in direction of flow, with tops of both pipes and reducer flush.
- C. Install piping level with no pitch.
- D. Connect branch-feed piping to mains at horizontal center line of mains, connect run-out piping to branches at horizontal center line of branches.
- E. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 INSTALLATION OF PIPING SPECIALTIES:

- A. Install piping specialties in accordance with Division-23 Basic Mechanical Materials and Methods section "Piping Specialties".

3.5 INSTALLATION OF SUPPORTS AND ANCHORS:

- A. Install supports and anchors in accordance with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.6 INSTALLATION OF VALVES:

- A. Install valves in accordance with Division-23 Basic Mechanical Materials and Methods section "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more hydronic terminals or equipment connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet and outlet of each mechanical equipment item, and on inlet of each hydronic terminal, and elsewhere as indicated.
- D. Hydronic Terminal Outlet Valves: Install on outlet of each hydronic terminal, and elsewhere as indicated.

- E. Drain Valves: Install on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain hydronic piping system.
- F. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.

3.7 INSTALLATION OF METERS AND GAGES:

- A. Install meters and gages in accordance with Division-23 Basic Mechanical Materials and Methods section "Meters and Gages".

3.8 EQUIPMENT CONNECTIONS:

- A. General: Connect hydronic piping system to mechanical equipment as indicated, and comply with equipment manufacturer's instructions where not otherwise indicated. Install shutoff valve and union on supply and return, drain valve on drain connection.
- B. Hydronic Terminals: Install hydronic terminals with hydronic terminal outlet valve and union on outlet; union, shutoff valve on inlet. Install manual air vent valve on element in accordance with manufacturer's instructions. Locate valves and balancing cocks behind valve access doors for ease of maintenance. Where indicated, install automatic temperature control valve with unions between gate valve and element on supply line.

3.9 INSTALLATION OF PREINSULATED PIPE SYSTEMS:

- A. Expansion/contraction compensation will be accomplished utilizing factory prefabricated and preinsulated expansion elbows, Z-bends, expansion loops and anchors specifically designed for the intended application. A factory engineered and P.E. sealed drawing shall be supplied.
- B. Underground systems shall be buried in a trench of not less than two feet deeper than the top of pipe and not less than eighteen inches wider than the combined O.D. of all piping systems. A minimum thickness of 24 inches of compacted backfill placed over the top of the pipe will meet H-20 highway loading.
- C. Apply rust inhibitor at joints prior to enclosing with insulation.
- D. A final hydrostatic pressure test of the carrier pipe shall be performed, with system pressure at 125 psig for not less than four hours. Care shall be taken to insure all trapped air is removed from the system prior to the test.
- E. Field service will be provided by a certified manufacturer's representative or company field service technician. The technician will be available at the job a minimum of three times to check unloading, storage and handling of pipe, joint installation, pressure testing and backfilling techniques.

3.10 FIELD QUALITY CONTROL:

- A. Piping Tests: Test hydronic piping in accordance with testing requirements of Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.11 ADJUSTING AND CLEANING:

- A. Cleaning, Flushing, and Inspecting: Clean, flush, and inspect hydronic piping systems in accordance with requirements of Division-23 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Chemical Treatment: Refill hydronic piping systems, adding caustic soda to maintain pH of 8.0 to 8.5 and sodium sulfate in amount of 1/3 caustic soda or to maintain residual of 30- to 40- ppm in system. Add trisodium phosphate to make hardness of 0-ppm and residual of approximately 30-ppm in system. Repeat measurements daily for 7 days minimum with system under full circulation and apply chemicals to adjust levels until no change is apparent.

END OF SECTION 23 23 13

SECTION 23 23 14 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of hydronic specialties required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of hydronic specialties specified in this section include the following:
 - 1. Balance Valves.
 - 2. Vent Valves.
 - 3. Air Separators.
 - 4. Compression Tanks
 - 5. Pump Discharge Valves.
 - 6. Shot Feeders.
 - 7. Liquid Flow Switches.
 - 8. Pressure Reducing Valves.
- C. Hydronic specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-23 sections.
- D. Refer to other Division-23 sections for insulation of hydronic specialties; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of hydronic specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Hydronic Specialty Types: Provide hydronic specialties of same type by same manufacturer.
- C. Codes and Standards:
 - 1. ASME Compliance: Manufacture and install hydronic specialties in accordance with ASME B31.9 "Building Services Piping".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of hydronic specialty. Include pressure drop curve or chart for each type and size of hydronic specialty. Submit schedule indicating manufacturer's figure number, size, location, rated capacities, and features for each required hydronic specialty.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weights, required clearances, and method of assembly of components.
- C. Maintenance Data: Submit maintenance data and spare parts lists for each type of hydronic specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTIES:

- A. General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option, but more than one type cannot be used on project.

2.2 BALANCE VALVES:

- A. General: Calibrated balance valves are specified in Specification Section 23135 Meters and Gauges and are work of this section.

2.3 VENT VALVES:

- A. Manual Vent Valves: Provide manual vent valves designed to be operated manually with screwdriver or thumbscrew, 1/8" NPS connection.
- B. Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, cast-iron body, pressure rated for 125 psi, 1/2" NPS inlet and outlet connections.
- C. Manufacturer: Subject to compliance with requirements, provide vent valves of one of the following:
 - 1. Armstrong Machine Works.
 - 2. Bell & Gossett ITT; Fluid Handling Div.
 - 3. Hoffman Specialty ITT; Fluid Handling Div.
 - 4. Spirax Sarco.

2.4 AIR SEPARATORS:

- A. General: Provide air separators pressure rated for 125 psi. Select capacity based on total system gpm.
- B. Combination Separator/Strainer: Provide external combination air separators/strainers as indicated. Construct of steel complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board Form U-1 denoting compliance. Provide galvanized steel integral strainer with 3/16" perforations and free area of not less than 5 times cross-sectional area of connecting lines. Provide tangential inlet and outlet connections and internal stainless steel air collector tube designed to direct released air into compression tank. Provide blowdown connections.
- C. Manufacturer: Subject to compliance with requirements, provide air separators of one of the following:
 - 1. Amtrol, Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. Bell & Gossett ITT; Fluid Handling Div.
 - 4. Griswold, Inc.
 - 5. Taco, Inc.

2.5 COMPRESSION TANKS:

- A. General: For chilled water service, provide floor-mounted bladder type expansion tanks of size and number as indicated. For heating water service, provide floor-mounted bladderless type expansion tanks of size and number as indicated. Construct of steel for 125 psi pressure rating complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board form U-1 denoting compliance. Provide tappings in bottom of tank for tank fitting; tappings in end of tank for gage glass.

- B. Tank Fittings: Provide tank fittings for compression tanks as indicated, sized for compression tank diameter. Design tank fittings for 125 psi pressure rating and include manual vent to establish proper air volume in tank on initial fill.
- C. Manufacturer: Subject to compliance with requirements, provide compression tanks and tank fittings of one of the following:
 - 1. Amtrol, Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. Bell & Gossett ITT; Fluid Handling Div.
 - 4. Taco, Inc.

2.6 PUMP DISCHARGE VALVES:

- A. General: Provide pump discharge valves as indicated. Provide non-slam check valve with spring-loaded disc and calibrated adjustment feature permitting regulation of pump discharge flow and shutoff. Design valves to permit repacking under full line pressure, and with bolt-on bonnet. Provide flanged cast-iron valve body, pressure rated for 175 psi, maximum operating temperature of 300°F (149°C). Provide straight or angle pattern as indicated.
- B. Manufacturer: Subject to compliance with requirements, provide pump discharge valves of one of the following:
 - 1. Amtrol, Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. Bell & Gossett ITT; Fluid Handling Div.
 - 4. Taco, Inc.

2.7 SHOT FEEDERS:

- A. General: Provide shot feeders of minimum 5 gal. capacity or otherwise as indicated, constructed of cast iron or steel, for introducing chemicals in hydronic system. Provide funnel and valve on top for loading, drain valve in bottom, and recirculating valves on side. Construct for pressure rating of 125 psi.
- B. Manufacturer: Subject to compliance with requirements, provide shot feeders of one of the following:
 - 1. Culligan USA.
 - 2. Efficiency Dynamix
 - 3. Vulcan Laboratories, Subsidiary of Clow Corp.
 - 4. York-Shipley, Inc.

2.8 PRESSURE REDUCING VALVES:

- A. General: Provide pressure reducing valves as indicated, of size and capacity as selected by Installer to maintain operating pressure on boiler system.
- B. Construction: Cast-iron or brass body, low inlet pressure check valve, inlet strainer removable without system shut-down, non-corrosive valve seat and stem, factory-set at operating pressure.
- C. Manufacturer: Subject to compliance with requirements, provide pressure reducing valves of one of the following:
 - 1. Amtrol, Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. Bell & Gossett ITT; Fluid Handling Div.
 - 4. Taco, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. General: Examine areas and conditions under which hydronic specialties are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF HYDRONIC SPECIALTIES:

- A. Balance Valves: At Installer's option, install balance valves in lieu of terminal outlet valves and balance cocks. Install on each hydronic terminal and elsewhere as indicated. After hydronic system balancing has been completed, mark each balance valve with stripe of yellow lacquer across body and stop plate to permanently mark final balanced position.

3.3 VENT VALVES:

- A. Manual Vent Valves: Install manual vent valves on each hydronic terminal at highest point, and on each hydronic piping drop in direction of flow for mains, branches, and runouts, and elsewhere as indicated.
- B. Automatic Vent Valves: Install automatic vent valves at top of each hydronic riser and elsewhere as indicated. Install shutoff valve between riser and vent valve, pipe outlet to suitable plumbing drain, or as indicated.
- C. Flow Control Valves: Install flow control valves on discharge of each pump serving hydronic heating system or zone, and elsewhere as indicated. Install with check mechanism in upright position, with adequate clearance for service and replacement. Screw check down for automatic operation.

3.4 AIR SEPARATORS:

- A. Combination Separator/Strainer: Install external combination separators/strainers in pump suction lines. Connect inlet and outlet piping. Run piping to compression tank with 1/4" per foot (2%) upward slope towards tank. Install blowdown valve and piping. Remove and clean strainer after 24 hours and again after 30 days of system operation.
- B. Compression Tanks: Install compression tanks on trapeze hangers sized for tank fully loaded, or otherwise as indicated. Install gage glass and cocks on end of tank. Install tank fitting in tank bottom and charge tank in accordance with manufacturer's instructions.
- C. Tank Fittings: Install tank fittings in bottom of compression tanks. Use manual vent for initial fill to establish proper water level in tank.
- D. Pump Discharge Valves: At Installer's option, install pump discharge valves on each pump discharge line in lieu of separate shutoff valve, check valve, and balance cock. Install in horizontal or vertical position with stem in upward position; allow clearance above stem for check mechanism removal. After hydronic system has been completed, mark calibrated name plate with stripe of yellow lacquer to permanently mark final balanced position.
- E. Shot Feeders: Install shot feeders on each hydronic system at pump discharge and elsewhere as indicated. Install in upright position with top of funnel not more than 48" above floor. Install globe valve in pump discharge line between recirculating lines. Pipe drain to nearest plumbing drain or as indicated.
- F. Liquid Flow Switches: Install liquid flow switches on inlet to water chiller, inlet to water condenser, and elsewhere as indicated. Install in horizontal pipe with switch mounted in tee on top of pipe with minimum of 24" of straight pipe with no fittings both upstream and downstream of switch. Remove segments of paddle to fit pipe in accordance with manufacturer's instructions.
- G. Pressure Reducing Valves: Install for chilled water makeup system.

END OF SECTION 23 23 14

HYDRONIC SPECIALTIES

23 23 14 - 4

SECTION 23 23 23 - HVAC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of HVAC pumps work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of pumps specified in this section include the following:
 - 1. Frame Mounted End Suction Pumps.
- C. Pumps furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-23 sections.
- D. Refer to other Division-23 sections for insulation of HVAC pump housings; not work of this section.
- E. Refer to other Division-23 sections for vibration control of HVAC pumps; not work of this section.
- F. Refer for Division-26 sections for the following work; not work of this section.
 - 1. Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
- G. Provide the following electrical work as work of this section, complying with requirements of Division-26 sections:
 - 1. Control wiring and conduit between field-installed controls, indicating devices, and pump control panels.
 - 2. Control wiring and conduit specified as work of Division-23 for Automatic Temperature Controls is work of Section 230900 - HVAC Control Systems.
 - 3. Interlock wiring specified as factory-installed is work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use centrifugal pumps with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".
 - 2. UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 778 "Motor Operated Water Pumps".
 - 3. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.

- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to HVAC pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts lists for each type of pump, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Handle HVAC pumps and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged HVAC pumps or components; replace with new.
- B. Store HVAC pumps and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's rigging and installation instructions for unloading HVAC pumps, and moving them to final location.

PART 2 - PRODUCTS

2.1 PUMPS:

- A. General: Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Type, size, and capacity of each pump is listed in pump schedule. Provide pumps of same type by same manufacturer.

2.2 FRAME-MOUNTED END SUCTION PUMPS:

- A. General: Provide frame-mounted end suction pumps where indicated, and of capacities and having characteristics as scheduled.
- B. Type: Horizontal mount, single stage, vertical split case, flexible coupling, base mounted, designed for 175 psi working pressure.
- C. Casing: Cast iron, 125 psi ANSI flanges, tapings for gage and drain connections.
- D. Shaft: Steel with replaceable shaft sleeve.
- E. Bearings: Replaceable and regreasable ball bearings.
- F. Seal: Mechanical, with carbon seal ring and ceramic seat.
- G. Motor: TEFC, replaceable and regreasable ball bearings.
- H. Impeller: Enclosed type, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.
- I. Baseplate: Structural steel with welded cross members, and open grouting area.
- J. Coupling: Flexible, capable of absorbing torsional vibration, equipped with coupling guard.
- K. Manufacturer: Subject to compliance with requirements, provide frame-mounted end suction pumps of one of the following:
 - 1. Armstrong Pumps, Inc.
 - 2. Aurora Pump: Unit of General Signal.
 - 3. Taco Pumps.
 - 4. ITT Bell & Gossett.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which HVAC pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PUMPS:

- A. General: Install HVAC pumps where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that HVAC pumps comply with requirements and serve intended purposes.
- B. Access: Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer.
- C. Support: Refer to Division-23 section "Vibration Control" for support and mounting requirements of HVAC pumps.
- D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- E. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- F. Piping Connections: Refer to Division-23 HVAC piping sections. Provide piping, valves, accessories, gages, supports, and flexible connections as indicated.

3.3 ADJUSTING AND CLEANING:

- A. Alignment: Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer, and in presence of manufacturer's service representative.
- B. Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.
- C. Refer to Division-23 section "HVAC Testing, Adjusting and Balancing" for pump system balancing; not work of this section.
- D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 23 23

SECTION 23 25 00 - WATER TREATMENT OF COOLING AND HEATING WATER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. Provide flushing, cleaning and charging services (work of this section) as follows:
 - 1. Chilled Water - After the air handlers have been installed and after pipe pressure tests have been successfully completed, flush and clean the chilled water system before initial charging. Charge the chilled water system with the initial charge of chemicals once the chilled water system has been flushed and cleaned.
- B. Chemicals for initial charging of condenser water and both closed systems, and in sufficient quantities for one year from start-up shall be provided by Nalco Water Treatment Company under contract to the Mechanical Contractor.
- C. Perform initial clean-out. The Mechanical Contractor shall flush and clean-out all closed recirculation water systems under the supervision of Water Treatment Specialist. All chemicals to be provided by Water Treatment Company. Maintain a concentration of 1,000 ppm of phosphate during the clean-up period. Drain and flush open recirculation system until clear. A report of completion shall be rendered by Water Treatment Company to the General Contractor, Architect and Owner.

1.3 SUBMITTALS BY WATER TREATMENT COMPANY:

- A. Shop drawings.
- B. Product information:
 - 1. Proposed chemicals to be used.
 - 2. Equipment specifications and drawings.
- C. Operating and maintenance manuals.

PART 2 - PRODUCTS

2.1 CLOSED-LOOP CHILLED WATER SYSTEM provided by Water Treatment Company and installed by Mechanical Contractor:

- A. Charge system with Borate-Nitrite to 800-1200 ppm by Water Treatment Company.

PART 3 - EXECUTION

3.1 WATER TREATMENT PROGRAM:

- A. Water Treatment Specialist shall supervise the equipment cleaning.
- B. Following installation of the system, a Water Treatment Specialist shall:
 - 1. Chemically treat all systems.
 - 2. Test the chemical properties of the make-up and the treated water to determine the proper control settings and chemical formula.
 - 3. Check the entire system for proper automatic operation.
 - 4. Following start-up, the regular maintenance schedule and chemicals prescribed by the service contract between the owner shall be complied with, as long as the service contract between the owner is in place – not work of this contract.
 - 5. The Water Treatment Specialist shall coordinate with the Mechanical Contractor for three (3) tower or condenser cleanings during the first year of operation. Cleaning shall be included in respective monthly report.

END OF SECTION 23 25 00

SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.
- B. Types of ductwork accessories required for project include the following:
 - 1. Dampers.
 - 2. Low pressure manual dampers.
 - 3. Control dampers.
 - 4. Counterbalanced relief dampers.
 - 5. Fire dampers.
 - 6. Turning vanes.
 - 7. Duct hardware.
 - 8. Duct access doors.
 - 9. Flexible connections.
- C. Refer to other Division-23 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
 - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
 - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
 - 3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
 - 4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.

- C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 1.

PART 2 - PRODUCTS

2.1 DAMPERS:

- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards".
- B. Control Dampers: Provide dampers with parallel blades for 2-position control, or opposed blades for modulating control. Construct blades of 26-ga. steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 26-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up. Provide locking quadrant damper operators.
- C. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 26-ga. aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 26-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.
- D. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
 - 1. Air Balance, Inc.
 - 2. Airguide Corp.
 - 3. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - 4. Louvers & Dampers, Inc.
 - 5. Penn Ventilator Co.
 - 6. Ruskin Mfg. Co.

2.2 FIRE DAMPERS:

- A. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 260 to 265°F (71 to 74°C) unless otherwise indicated. Dampers shall be installed out of the air stream so that there is no restriction imposed upon the flow of air. Provide damper with positive lock in closed position, and with the following additional features:
 - 1. Damper Blade Assembly: Curtain type.
 - 2. Blade Material: Steel, match casing.
- B. Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:
 - 1. Air Balance, Inc.
 - 2. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - 3. Louvers and Dampers, Inc.
 - 4. Penn Ventilator Co.
 - 5. Phillips-Aire.
 - 6. Ruskin Mfg. Co.

2.3 TURNING VANES:

- A. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

- B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.
- C. Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:
 - 1. Aero Dyne Co.
 - 2. Airsan Corp.
 - 3. Anemostat Products Div.; Dynamics Corp. of America.
 - 4. Barber-Colman Co.
 - 5. Duro Dyne Corp.
 - 6. Environmental Elements Corp.; Subs. Koppers Co., Inc.
 - 7. Hart & Cooley Mfg. Co.
 - 8. Register & Grille Mfg. Co., Inc.
 - 9. Souther, Inc.

2.4 DUCT HARDWARE:

- A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
 - 1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
 - 2. Quadrant Locks: Provide for each damper (including dampers at spin-in duct take-offs), quadrant lock device on one end of shaft; and end bearing plate on other end. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork. Provide extensions for all damper operators for volume control dampers located above hard ceilings with no access.
- B. Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:
 - 1. Ventfabrics, Inc.
 - 2. Young Regulator Co.

2.5 DUCT ACCESS DOORS:

- A. General: Provide where indicated, duct access doors of size indicated.
- B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
- C. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
 - 1. Air Balance Inc.
 - 2. Duro Dyne Corp.
 - 3. Register & Grille Mfg. Co., Inc.
 - 4. Ruskin Mfg. Co.
 - 5. Ventfabrics, Inc.
 - 6. Zurn Industries, Inc.; Air Systems Div.

2.6 FLEXIBLE CONNECTIONS:

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to

allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

- B. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
 - 1. American/Elgen Co.; Energy Div.
 - 2. Duro Dyne Corp.
 - 3. Flexaust (The) Co.
 - 4. Ventfabrics, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES:

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90° elbows in supply and exhaust air systems, and elsewhere as indicated.
- C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install access doors adjacent to all fire dampers to allow maintenance and inspection of each fire damper. Minimum size of access doors shall be 12 inches square.
- D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 ADJUSTING AND CLEANING:

- A. Adjusting: Adjust ductwork accessories for proper settings.
- B. Label access doors in accordance with Division-23 section "Mechanical Identification".
- C. Final positioning of manual dampers is specified in Division-23 section "Testing, Adjusting, and Balancing".
- D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 33 00

SECTION 23 34 16 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of centrifugal fans work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of centrifugal fans required for project include the following:
 - 1. Inline Centrifugal Fans.
- C. Refer to other Division-23 sections for vibration control used in conjunction with centrifugal fans; not work of this section.
- D. Refer to Division-23 sections for testing, adjusting, and balancing work required in conjunction with centrifugal fans; not work of this section.
- E. Refer to other Division-23 control systems sections for control work required in conjunction with centrifugal fans; not work of this section.
- F. Refer to Division-26 sections for the following work; not work of this section.
 - 1. Power supply wiring from power source to power connection on fan motor. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
 - 2. Interlock wiring between fan units; and between fans and field-installed control devices.
 - 3. Interlock wiring specified as factory-installed work this section.
- G. Provide the following electrical work as work of this section, complying with requirements of Division-26 sections:
 - 1. Control wiring between field-installed controls, indicating devices, and fan starters.
 - 2. Control wiring specified as work of Division-23 for Automatic Temperature Controls is work of that section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of centrifugal fans, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
 - 1. AMCA Compliance: Provide centrifugal fans bearing the AMCA Certified Ratings Seal. Sound rate centrifugal fans in accordance with AMCA 300 "Test Code for Sound Rating Air Moving Devices".
 - 2. ASHRAE Compliance: Test and rate centrifugal fans in accordance with ASHRAE 51 (AMCA 210) "Laboratory Methods of Testing Fans for Rating".
 - 3. UL Compliance: Provide centrifugal fan electrical components which have been listed and labeled by UL.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for centrifugal fans, including specifications, capacity ratings, fan performance curves with operating point clearly indicated, gages and finishes of materials, dimensions, weights, accessories furnished, and installation instructions.
- B. Shop Drawings: Submit assembly-type shop drawings showing fan dimensions, required clearances, construction details, and field connection details.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to fan units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in maintenance manuals; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver centrifugal fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.
- B. Handle centrifugal fans carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to centrifugal fan manufacturer.
- C. Store centrifugal fans in clean dry place and protect from weather and construction traffic.
- D. Comply with manufacturer's rigging and installation instructions for unloading centrifugal fans, and moving them to final location.

PART 2 - PRODUCTS

2.1 INLINE CENTRIFUGAL FANS:

- A. General: Provide inline centrifugal fans of sizes and arrangement as indicated, and of capacities and having accessories as scheduled.
- B. Housing: Aluminum split housing, constructed of spun aluminum, with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Provide direct drive motor with sealed bearings.
- D. Wheel: Provide aluminum air foil blades on aluminum hub.
- E. Accessories: Provide the following accessories as indicated and/or scheduled:
 - 1. Volume Control Damper: Provide manual controlled volume damper in fan outlet with quadrant and lock.
 - 2. Companion Flanges: Provide matching flanges on inlet and outlet to connect ductwork to fan.
 - 3. Fan Guards: Provide guards on inlets and outlets not connected to ductwork, constructed of expanded metal in removable frame.
- F. Manufacturer: Subject to compliance with requirements, provide inline centrifugal fans of one of the following:
 - 1. Acme Engineering and Manufacturing Corp.
 - 2. Cook (Loren) Co.
 - 3. Greenheck
 - 4. Penn Ventilator Co.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which centrifugal fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF CENTRIFUGAL FANS:

- A. General: Install centrifugal fans where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that centrifugal fans comply with requirements and serve intended purposes.
- B. Access: Provide access and service space around and over centrifugal fans as indicated, but in no case less than that recommended by manufacturer.
- C. Isolation: Set centrifugal fans on vibration isolators, fasten in accordance with manufacturer's installation instructions.
- D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- E. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to centrifugal fan Installer.
- F. Ductwork Connections: Refer to Division 23 "Ductwork" sections. Provide flexible connections on inlet and outlet duct connections.

3.3 FIELD QUALITY CONTROL:

- A. Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

3.4 ADJUSTING AND CLEANING:

- A. Start-up, test, and adjust centrifugal fans in presence of manufacturer's authorized representative.

3.5 SPARE PARTS:

- A. None.

END OF SECTION 23 34 16

SECTION 23 37 13 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of air outlets and inlets required for project include the following:
 - 1. Ceiling air diffusers and grilles.
 - 2. Louvers.
- C. Refer to other Division 23 sections for ductwork and duct accessories required in conjunction with air outlets and inlets; not work of this section.
- D. Refer to other Division 23 sections for balancing of air outlets and inlets; not work of this section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
 - 2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
 - 3. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
 - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
 - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
 - 3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Diffuser Dampers: Fire Damper: Combination adjustable opposed blade damper and fusible link fire damper with UL approved link and assembly designed to meet requirements of NFPA 90A.
- E. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.
- F. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
 - 1. Anemostat Products Div.; Dynamics Corp. of America.
 - 2. Carnes Co.; Div. of Wehr Corp.
 - 3. Krueger Mfg. Co.
 - 4. Metalaire
 - 5. Titus Products Div.; Philips Industries, Inc.

2.2 LOUVERS:

- A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.,
- B. Performance: Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.
- C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
- D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners. Coordinate color with the Architect.
- E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
- F. Manufacturer: Subject to compliance with requirements, provide louvers of one of the following:
 - 1. Airline Products Co.
 - 2. Airolite Co.
 - 3. American Warming & Ventilating, Inc.
 - 4. Arrow United Industries, Inc.
 - 5. Construction Specialties, Inc.

6. Dowco Corp.
7. Industrial Louvers, Inc.
8. Louvers & Dampers, Inc.
9. Safe-Air Inc.
10. Snyder (E.G.) Co., Inc.
11. Vent Products Co., Inc.

2.3. INSULATED BLANK-OFF PANELS:

- A. General: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
- B. Thickness: 2 inches.
- C. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

3.3 SPARE PARTS:

- A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 23 37 13

SECTION 23 73 13 – PACKAGED AIR-COOLED WATER CHILLERS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 specification sections, apply to work of this section.
- B. Division – 23 Basic Mechanical Materials and Methods section apply to work of this section.

1.2 SCOPE:

- A. The work under this section shall include furnishing all labor, materials, tools, appliances, and equipment, and performing all operations necessary for the complete installation of all equipment as shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.
- B. Refer for Division – 26 sections for the following work; not work of this section.
 - 1. Power supply wiring from power source to power connection on chiller contactor enclosure. Include disconnects and starters as a part of Division – 23 where specified as furnished, or factory-installed, by manufacturer.
 - 2. Control power circuit from power source to chiller control panel in chiller.
- C. Provide the following electrical work as work of this section, complying with requirements of Division – 26 sections:
 - 1. Control wiring and conduit between field-installed controls, indicating devices, and pump control panels.
 - 2. Control wiring and conduit specified as work of Division – 23 for automatic Temperature Controls is work of Section 23971 – Automatic Temperature Controls.
 - 3. Interlock wiring specified as factory-installed is work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of general-use packaged water chillers with characteristics, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Air Conditioning and Refrigeration Institute (ARI):
 - 1. 490-85 Refrigerant Liquid Receivers
 - 2. 520-85 Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units
- C. American Society of Mechanical Engineers (ASME):
 - 1. Boiler and Pressure Vessel Code
 - 2. Section 8-D-2-86, Pressure Vessels, Division 1
- D. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - 1. 23-92 Safety Code for Mechanical Refrigeration
- E. American Society for Testing and Materials (ASTM):
 - 1. C534-82 Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's chiller specifications, installation and start-up instructions, and current accurate chiller performance data. Submit surge suppression devices to be provided with chiller.

- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to the chiller. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts lists for the chiller, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division – 1.
- E. Refer to Division – 26 sections for the following work; not work of this section.
 - 1. Power supply wiring from power source to power connection on pumps. Include starters, disconnects, and required electrical devices as a part of Division – 23 where specified as furnished, or factory-installed, by manufacturer.
- F. Provide the following electrical work as work of this section, complying with requirements of Division – 26 sections:
 - 1. Control wiring between field-installed controls, indicating devices, and pump control panels.
 - 2. Control wiring specified as work of Division – 23 for Automatic Temperature Controls is work of Sections 23971 – Automatic Temperature Controls.
 - 3. Interlock wiring specified as factory-installed is work of this section.

PART 2 – PRODUCTS

2.1 GENERAL:

- A. Furnish and install as shown on the plans factory assembled, factory charged, and factory run tested air-cooled scroll compressor packaged chillers in the quantity specified. Each chiller shall consist of multiple hermetic scroll compressors, direct expansion evaporator, air-cooled condenser section, control system and all components necessary for safe and controlled unit operation.
- B. Manufacturer: Subject to compliance with requirements. Air handlers and chillers will be of the same manufacturer:
 - 1. ArctiChill
 - 2. MultiStack
 - 3. Approved Equivalent

2.2 DESIGN REQUIREMENTS:

- A. General: The unit shall be pressure-tested, evacuated, and fully charged with Refrigerant-410A (R-410A) and shall include an initial oil charge. After assembly, a complete operational test shall be performed with water flowing through the cooler to assure that the refrigeration circuit operates correctly.
- B. Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum of 26.7 percent of full load without hot gas bypass. Performance shall be in accordance with ARI Standard 590.
- C. Acoustics: Sound pressure levels for the units shall meet or be lower than 67 dBA on the overall "A" weighted sound pressure level as measured from a distance of 30 feet from the side of the unit. Chiller manufacturer to provide acoustical treatment as necessary to meet this criteria.
- D. Construction: The unit structure shall be heavy-gauge, galvanized steel. This galvanized steel shall be coated with baked-on powder paint, which, when subjected to ASTM B117 500 hour, salt spray testing, yields a minimum ASTM 2654 rating of "6". Units shall be designed in accordance with NFPA 70 (National Electric Code), ASHRAE/ANSI 23 Safety code for mechanical refrigeration, ASME and rated in accordance with ARI Standard 550/590-98.

- E. Compressors: The chiller shall have suction-gas cooled, hermetic, scroll compressors. The compressors shall incorporate a compliant scroll design in both the axial and radial direction. All rotating parts shall be statically and dynamically balanced. A large internal volume and oil reservoir provides greater liquid tolerance. Compressor crankcase heaters shall be included for extra protection against liquid migration.
- F. Evaporator: The cooler shall be equipped with a heater controlled by a separate thermostat. The heater shall provide freeze protection for the cooler down to –20°F ambient. The cooler shall be covered with minimum 3/4" flexible, closed-cell, foam insulation (K=0.25). The water baffles shall be constructed of galvanized steel to resist corrosion. The removable heads shall allow access to the internally enhanced, seamless, copper tubes. Vent and drain connections shall be included. Water inlet and outlet connections shall be grooved for compatibility with field supplied Victaulic connections.
- G. Condenser: Fin and tube or micro channel condenser coils of seamless, internally-enhanced, high-condensing-coefficient, corrosion resistant copper tubes shall be arranged in staggered rows, mechanically expanded into aluminum fins. Integral subcooling shall be included. The design working pressure of the coil shall be 450 PSIG. The condenser fans shall be composed of corrosion resistant aluminum hub and aluminum. They shall be designed for maximum efficiency and shall be statically and dynamically balanced for vibration free operation. They shall be directly driven by independent motors, and positioned for vertical air discharge. The fan guards shall be constructed of heavy-gauge, rust-resistant, coated steel. All blades shall be statically and dynamically balanced for vibration-free operation. The fan motors shall be Totally Enclosed Air-Over, squirrel-cage type, current protected. ODP condenser fan motors are not acceptable. They shall feature ball bearings that are double-sealed and permanently lubricated.
- H. Coil Coating: Provide coating on all condenser coils, as described herein.
 - 1. All condenser coils shall be provided with a factory-applied coating resistant to a salt air environment. Coil coating shall be proven in similar salt exposure applications for minimum 6,000 hours salt spray test in accordance with ASTM B-117.
 - 2. The coil coating company shall prove experience in salt resistant coatings for a period of over 10 years. The coating vendor shall provide a written 10 year warranty on all coil coatings with coil replacement (parts and labor included). Coating shall be performed in a controlled factory environment and shall be a "dip" coat process that fully covers coil fins, tubes and casing. Pre-coating fins without final "dip" coating is not acceptable. Field application coatings shall be limited to additional coverage of equipment, touch-up, and warranty work. Coating shall be: epoxy (E-coat) process with urethane U.V. top coats, polyelastomer (equal to Bronze-Glow), or phenolic epoxy (equal to "Heresite" products).
 - 3. The condensing units shall be sized to compensate for capacity losses due to coatings. Any degradation of equipment performance shall be clearly indicated in that equipment's shop drawing.
 - 4. Standard, uncoated aluminum fin, copper tube coils are not acceptable for exterior condenser coils.
- I. Refrigerant Circuit: Each refrigerant circuit shall include: compressor suction and discharge line shutoff valve, liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, sight glass with moisture indicator, thermostatic expansion valves, and flexible, closed-cell foam insulated suction line.
- J. Microprocessor Control Center shall include automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transient. The Microprocessor Control Center shall be enclosed in a rain and dust tight NEMA 3R/12 powder painted steel cabinet with hinged, latched, and gasket sealed door.
 - 1. Provide automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pumpdown shutdown, condenser fans, evaporator pump, evaporator heater, unit alarm contacts, and chiller operation from 0°F to 125°F ambient. Provide automatic reset to normal chiller operation after power failure.
 - 2. Provide remote water temperature reset via a Pulse Width Modulated (PWM) input signal or up to two steps of demand (load) limiting.

3. Provide software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed real time clock (RTC) memory for minimum 5 years.
 4. Provide minimum forty character liquid crystal display, descriptions in English, numeric data in English units. Provide sealed keypad with sections for Setpoints, Display/Print, Entry, Unit Options & clock, and On/Off Switch.
 5. Programmable Setpoints (within Manufacturer limits) shall include: display language; chilled liquid temperature setpoint and range, remote reset temperature range, set daily schedule/holiday for start/stop, manual override for servicing, low and high ambient cutouts, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).
 6. Display Data shall include: Return and leaving liquid temperatures, low leaving liquid temperature cutout setting, low ambient temperature cutout setting, outdoor air temperature, English data, suction pressure cutout setting, each system suction pressure, discharge pressure, liquid temperature reset via Building Automation System (by others) via PWM input as standard or a 4-20milliamp or 0-10 VDC input or contact closure with optional BAS interface, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves, evaporator heater and fan operation, run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.
 7. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. Include high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.
 8. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation. Contractor shall provide flow switch and wiring per chiller manufacturer requirements.
 9. Alarm Contacts: Provide low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.
 10. Provide surge suppression devices for protection of all low voltage control and communications circuits. Devices shall be by EDCO, DiTek, Joslyn, or chiller manufacturer approved equal, and selected for the appropriate clamping voltage and surge energy capacity for each application.
- K. Power Connection: Provide Single Point Disconnect with Individual System Breakers: Single point Terminal Block with Non-Fused Disconnect and lockable external handle (in compliance with Article 440-14 of N.E.C.) shall be supplied to isolate power voltage for servicing. Provide factory-installed interconnecting wiring from disconnect to factory supplied circuit breakers.

2.3 REQUIRED OPTIONS AND ACCESSORIES

- A. Control Transformer: Shall convert unit power voltage to 123-1-60 (500VA capacity). Factory mounting includes primary- and secondary wiring between the transformer and the control panel. (Factory-mounted.)
- B. Low Ambient Kit: This accessory shall include all necessary components to permit chiller operation to 35°F ambient temperature. (Factory-mounted.)
- C. Suction Pressure Transducers: The addition of suction transducers shall allow the chiller to sense and display suction pressure. (Factory mounted.)
- D. Service Isolation Valves: Compressor service suction and discharge (ball type) isolation valves shall be added to unit per system in addition to the liquid line shutoff valves. Include a system high-pressure relief valve in compliance with ASHRAE 23. (Factory-mounted.)
- E. Crankcase Heaters: Provide compressor crankcase heaters for extra protection against liquid migration. (Factory-mounted.)

- F. Flow Switch: The flow switch or its equivalent shall be furnished with each unit. Provide vapor-proof SPDT, NEMA 4X switch (230 PSIG DWP), -20°F to 250°F, with 1" NPT connection for upright mounting in horizontal pipe. (Field-mounted.)
- G. Low Sound Fans: Provide low sound fans as required to meet specified maximum sound levels. (Factory-mounted.)
- H. Vibration Isolation: Neoprene pad isolators for mounting under unit base rails. (Field-mounted.)
- I. Protective Wire Panels for Hail Protection: Shall consist of close mesh (1/2") one-half inch (max.) welded-wire-mesh guards mounted on the exterior of the unit over the condenser coils and lower section of the chiller, which houses the compressors and evaporator to prevent unauthorized access, yet provide free air flow. (Factory-mounted.)

2.4 START-UP SERVICE:

- A. Start-up Service: Manufacturer shall furnish a factory-trained service representative to perform leak testing, evacuation, dehydration, and charging of the unit. Chiller manufacturer shall maintain service staff no more than 25 miles from the jobsite. The service agency noted shall be the direct representative of the manufacturer and shall devote the majority of its efforts on behalf of manufacturer's equipment and shall not be merely a local service company designated by the manufacturer. Start-up service shall include the following:
 - 1. Check equipment for possible shipping damage.
 - 2. Check all safety controls and interlocks.
 - 3. Check unit installation and isolation.
 - 4. Pressure test leak check, and charge unit with manufacturer provided refrigerant.
 - 5. Start unit and make necessary adjustments.
 - 6. Provide formal factory training for proper operation of equipment for owner staff.
 - 7. Provide complete report of activities accomplished.
- B. The installing Contractor shall be responsible for the installation of the equipment and any associated piping and wiring in accordance with the manufacturer's recommendations. Contractor shall be responsible for all pneumatic piping and/or electrical control work. He shall notify the manufacturer 10 days prior to start-up procedure. The Contractor shall also be responsible for placing the pumps, and system in proper operation so that a load is available for the start-up of the machine.

PART 3 – EXECUTION

3.1 EQUIPMENT:

- A. Each piece of equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents. The installation shall be accomplished by workmen skilled in this type of work.
- B. Each piece of equipment shall be installed to be free of noise and vibration. Provide vibration isolators as per manufacturer's recommendations and/or as herein specified.
- C. Deliver equipment to the site in manufacturer's original packaging. Clearly mark each item with the proper identification number. Store in accordance with the requirements of Section 23010.

3.2 WARRANTY:

- A. Each chiller shall be provided with a one year warranty for both parts and labor by the manufacturer. In addition each chiller shall be provided with an extended four-year compressor parts only warranty. The manufacturer's warranty shall cover items found to be defective in material and workmanship and does not include routine maintenance or service.

END OF SECTION 23 73 13

SECTION 23 74 13 - AIR HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. The air handler has already been bid directly to the manufacturers for a direct purchase arrangement. The scope of work for this project consists of installing the air handler, and providing a warranty as indicated herein for the air handler and its installation. Extent of air handling unit work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of air handling units required for project include the following:
 - 1. Factory fabricated variable volume air handling unit.
- C. Refer to other Division-23 sections for piping; ductwork; and testing, adjusting and balancing of air handling units; not work of this section.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications for air handling units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.
 - 1. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
 - 2. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Handle air handling units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged air handling units or components; replace with new.
- B. Store air handling units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's rigging and installation instructions for unloading air handling units, and moving them to final location.

1.5 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air handlers, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
- C. Air-Conditioning and Refrigeration Institute (ARI):
 - 1. 430-78 Standard for Central Station Air Handling Units. Directory of Certified Applied Air Conditioning Products
- D. Air Moving and Conditioning Association (AMCA):
 - 1. 99-83 Standards Handbook
 - 2. 300-67 Test Code for Sound Rating
 - 3. 301-76 Methods for Calculating Fan Sound Ratings from Laboratory Test Data
- E. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - 1. 68-78 Method of Testing In-Duct Sound Power Measurement Procedure for Fans

- F. American Society for Testing and Materials (ASTM):
 - 1. C423-77 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - 2. D3359-83 Measuring Adhesion by Tape Test
 - 3. E84-81* Surface Burning Characteristics of Building Materials
 - 4. E90-81* Airborne-Sound Transmission Loss of Building Partitions, Laboratory Measurement
 - 5. E413-73* Sound Transmission Class, Classification for Determination
 - 6. G23-81 Operating Light-Exposure Apparatus
- G. Anti-Friction Bearing Manufacturer's Association, Inc. (AFBMA):
 - 1. 9-1978 Load Ratings and Fatigue Life for Ball Bearings
- H. National Fire Protection Association (NFPA):
 - 1. 90A-1985 Installation of Air Conditioning and Ventilating Systems

PART 2 - PRODUCTS

2.1 FACTORY FABRICATED AIR HANDLING UNIT

- A. Standards and Certification Compliance:
 - 1. Standards: ARI 430.
 - 2. Certification: ARI Directory of Certified Applied Air Conditioning Products.
 - 3. Operating limits: AMCA 99 (Class A, B, C, as defined by Standard 1401-66).
 - 4. Sound power level ratings: AMCA 300 and 301, or ASHRAE 68.
- B. Casings: Double wall, 26 guage 201 stainless steel, or equivalent strength construction, fastened to a steel support frame. Provide reinforced support points for setting or hanging the unit.
 - 1. All steel shall be mill-galvanized, or phosphatized and coated inside and out with minimum two coats, corrosion resistant enamel paint. Manufacturers paint and paint system shall meet the minimum specifications of ASTM D3359 adhesion.
 - 2. Coil and fan casings shall have removable panels for servicing or replacement of components. These removable panels are not to be construed as inspection or access panels.
 - a. Unit inspection doors shall be a minimum of 6 inches high by 6 inches wide in each end of fan sections and in other locations shown on the drawings. Doors shall be double wall, insulated, hinged and provided with heavy duty latches. Doors shall be designed to open against the unit static pressure unless properly safety latched and gasketed to prevent air leakage.
 - b. Unit access doors shall be provided, as shown on drawings. Access doors shall be double wall, insulated, hinged and provided with heavy duty latches. Minimum door width shall be 12 inches. Door height shall be full height as determined by unit casing but not to exceed 6'-0". Doors shall be hinged to open against fan operating pressure unless properly safety latched and gasketed to prevent air leakage.
 - c. Airway access sections with hinged and latched access doors shall be provided as shown on drawings. Sections shall be provided with access doors on each side unless otherwise indicated on drawings. Access sections located downstream of the cooling coil shall be insulated as specified for unit casing.
- C. Fan: Double width, double inlet airfoil type, factory balanced. The maximum allowable noise generation is indicated on the drawings. The vibration tolerance is specified in Section, NOISE AND VIBRATION CONTROL. Provide self-aligning, pillow block or flanged type, regreaseable, ball type bearings selected for 200,000 hours average life, per AFBMA Standard 9. Extend grease lines for interior fan or motor bearings to the outside of the casing. Internally mounted motors and drives do not require a separate drive guard.
 - 1. Fan motor and drive: Furnish from the factory with the air handling unit.
 - 2. Flexible connection: Provide for units with internally mounted motor and drive.
- D. Fan Section Construction: Fan, motor and drive assembly shall be factory mounted on an isolation frame supported on springs with 1-1/2 inches minimum deflection. Provide thrust restraint spring for fans with

horizontal discharge. External vibration isolation, and flexible connections to ductwork and in piping to and from coils are required in addition to the internal isolation.

E. Coils:

1. Tubes: Seamless copper tubing - .025" nominal thickness.
2. Fins: 0.0055 inch aluminum mechanically bonded or soldered or helically wound around tubing. Provide copper fins for sprayed coil applications.
3. Headers: Copper, welded steel or cast iron.
4. "U" Bends, Where Used: Machine die formed, silver brazed to tube ends.
5. Coil Casing: 16 gage Type 304 stainless steel with tube supports at 48-inch maximum spacing. Construct casing to eliminate air bypass and moisture carry-over. Provide duct connection flanges.
6. Protection: Unless protected by the coil casing, provide cardboard, plywood, or plastic material at the factory to protect tube and finned surfaces during shipping and construction activities.
7. Vents and Drain: Coils that are not vented or drainable by the piping system shall have capped vent/drain connections extended through coil casing. Construct of red brass (non-ferrous) material.
8. Condensate Drain Pan: Condensate drain pan shall be constructed of Type 304 stainless steel and shall be sloped at 1/8" per foot to the outlet. Extend under cooling coil and header. Provide outlet connection. Insulate pan with not less than 1/2-inch thick, rigid, water impervious insulation of sprayed or foamed-in-place type. Insulation adhesive and inner coating shall comply with NFPA 90A flame spread and smoke generation requirements.
9. Filter Box: Provide for type of filters shown.
10. Internal Insulation:
 - a. Materials shall meet NFPA 90A flame spread and smoke generation requirements.
 - b. Fiberglass: Provide 2 inch thick, 1-1/2 PCF insulation between the outer casing and the inner liner, factory applied with adhesive and mechanical fasteners. Apply sealant to all visible raw edges and butt joints of insulation. Provide full uncompressed insulation 2" thick under condensate drain pan. Provide additional insulation under coil section with additional protective metal liner if required to meet this specification.

F. Manufacturer: Subject to compliance with requirements, provide air handling units of one the following. Air handlers and chillers will be of the same manufacturer::

1. Carrier
2. McQuay
3. Trane
4. York

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify that coils, filters, motors, drives and other components are matched with the proper air handling unit.
- B. Assemble air handling unit components following manufacturer's instructions for handling, testing and operation. Repair damaged galvanized areas, and paint.
- C. Vacuum clean interior of air handling units prior to operation.
- D. Repair air leaks from or into casing that can be heard or felt during normal operation.

3.2 WARRANTY

- A. Provide a five-year parts and labor warranty for the air handling unit.

END OF SECTION 23 74 13

SECTION 26 05 00 - BASIC METHODS AND REQUIREMENTS (ELECTRICAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to work of this section.
- B. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, cable, panelboards, etc., and arrangement for specified items in general are shown on drawings.
- C. All ampacities herein specified or indicated on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are not permitted.

1.2 MINIMUM REQUIREMENTS

- A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), the Florida Building Code, and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in NEC.
- B. The rules and regulations of the Federal, State, local, civil authorities and utility companies in force at the time of execution of the contract shall become a part of this specification. In addition, the following codes and standards shall apply:
 - 1. National Electrical Code - 2014
 - 2. 6th Edition of the Florida Fire Prevention Code (2017), including NFPA-101 – Florida Specific Edition
 - 3. Florida Building Code – (FBC) 6th Edition (2017)
- C. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.
- D. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.
- E. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.3 SPECIFICATIONS AND DRAWINGS

- A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.
- B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.
- C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing in pencil on sepia reproducibles, any deviations from the original Drawings, indicating in the Specifications each manufacturer's name underlined or inserted whose product was

used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of sepia reproduces of the original tracings will be furnished upon request for this purpose.

1.4 STANDARDS

- A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
 - 1. Listed: Equipment is "listed" if of a kind mentioned in a list which:
 - a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
 - b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
 - 2. Labeled: Equipment is labeled if:
 - a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
 - b. The laboratory makes periodic inspections of the production of such equipment.
 - c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
 - 3. Certified: Equipment is "certified" if:
 - a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
 - b. Production is periodically inspected by a nationally recognized testing laboratory.
 - c. It bears a label, tag, or other record of certification.
 - 4. Nationally recognized Testing Laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.
 - 5. Contractor: Any reference to Contractor shall mean the Construction Manager.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least five years, unless otherwise noted elsewhere in the specifications or on the drawings.
- B. Product Qualification:
 - 1. Manufacturer's product shall have been in satisfactory operation on three installations of similar size and type, as this project, for approximately three years.
 - 2. The Owner reserves the right to require the contractor to submit a list of installations where the products have been in operation before approval of said products.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.6 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. Items not meeting

this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.

- B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 - 1. All components of an assembled unit need not be products of the same manufacturer, however, the assembled unit shall be the responsibility of a single manufacturer and warranted as such.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. All factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

1.7 EQUIPMENT REQUIREMENTS

- A. Equipment voltage ratings shall be in accordance with the requirements indicated on the drawings or as specified.
- B. Prior to bid, written approval shall be obtained by the Contractor for any equipment that differs from those specified on the drawings and specifications. The Contractor shall be prepared to submit samples of the equipment when requested at no cost to the Architect/Engineer.
 - 1. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required to determine that the equipment is equivalent in quality and function to the equipment specified.
 - 2. Approval by the Architect/Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost to the Owner.
 - 3. Any other items required for the satisfactory installation of the equal equipment shall be furnished and installed at no additional cost to the Owner. This includes but shall not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and correlation with other work, subject to the jurisdiction and approval of the Architect/Engineer.
- C. Catalogue numbers, where given, are intended to give a basis for design, quality and function. Any other incidental equipment needed for a complete and functional installation shall be provided at no additional cost.
- D. EQUIPMENT PROTECTION: Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.
- E. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing, operating and painting.
- F. Damaged equipment shall be, as determined by the Architect/Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
- G. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
- H. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 WORK PERFORMANCE

- A. Arrange, phase and perform work to assure electrical service for other buildings at all times.

- B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions.
- C. Coordinate location of equipment and conduit with other trades to minimize interferences.
- D. Obtain and pay for all required installation inspections and deliver certificates approving installations to the Owner unless directed otherwise.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings. Where architectural features govern location of work, refer to architectural drawings.
- B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.
- C. Inaccessible Equipment:
 - 1. Where the Owner/Architect/Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
 - 2. "Conveniently accessibility" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.
- D. Equipment and Material:
 - 1. New equipment and material shall be installed, unless otherwise specified.
 - 2. Equipment and material shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, watertight and weatherproof construction.
- E. Utility Services:
 - 1. Contact Tampa Electric and schedule all required power company work in a timely manner. Make application and deliver all required documentation to Tampa Electric so they schedule their work to coincide with the work of the project. See drawings for work to be provided by the contractor.
 - 2. Include all costs for temporary service, temporary routing of service or any other requirements of a temporary nature associated with the utility service.
 - 3. Note: The Water Treatment Plant is primary metered. All on-site transformers are City owned. Coordinate any and all work associated with any existing transformers or any other existing electrical equipment with the City. Any downtime periods will be very restrictive and must have a minimum of two weeks prior approval by the City.
- F. Continuity of Service:
 - 1. No electrical service and no telecommunications service (voice/data, fire alarm, security, SCADA) shall be interrupted or changed without prior permission from the Architect and the Owner. A minimum of a two week notice shall be provided and written permission from the City shall be obtained before any work is started.
 - 2. When interruption of services is required, all persons concerned shall be notified and a prearranged time agreed upon.
- G. Concrete Work:
 - 1. Provide all cast-in-place concrete shown on the documents unless noted otherwise. Concrete work shall conform to all applicable Division 02 and 03 specification sections.
 - 2. Provide all anchor bolts, metal shapes and templates required to be cast in concrete or used to form concrete for support of electrical equipment.

1.10 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the National Electrical Code, install an identification nameplate which will clearly indicate information required for use and maintenance of items such as switchboard, panelboards, cabinets, safety switches, separately enclosed circuit breakers, motor starters, communications systems cabinets, control devices and other significant equipment. Refer to details on drawings for nameplates and section 26 05 53.
- B. Nameplates shall be laminated white phenolic resin with a black core with engraved lettering, a minimum of 3/16-inch high. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions. Hand written marker is not acceptable. Nameplates shall be permanently attached with rivets or tamperproof screws.

1.11 SUBMITTALS

- A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.
- B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.
- D. Prepare and submit shop drawings and submittals in accordance with Specifications Section 01 33 00 - SUBMITTAL PROCEDURES.
- E. Operation and Maintenance Manuals:
 - 1. Maintenance manuals shall be complete and shall be furnished in a loose leaf binder or in the manufacturer's standard binder. Information shall be sufficient to enable a qualified technician to perform normal first line maintenance and repair. A parts list shall be included which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
 - 2. Operation manuals shall be clear and concise and shall describe, in detail, the information required to properly operate the equipment specified. The manuals shall include complete catalog cuts and as-built wiring diagrams.
 - 3. Operation and maintenance manuals shall be submitted for approval prior to final inspection.
- F. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.12 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

- A. Provide openings and excavation required for the installation of the electrical work. Patch work and backfill as required. Finished work shall match the existing adjoining work.
- B. Verify all conditions affecting the work to be performed under this contract.
- C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Architect/Engineer.

- D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Where hand shovel is not practical extreme caution shall be taken when performing excavation. The contractor will be responsible for locating any existing utilities. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Architect/Engineer at no cost to the Owner and with no extension of time limitation.

1.13 EXPERIENCE

- A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least three jobs of similar character and size installed within the preceding two years.

1.14 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

- A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 23 Mechanical.
- B. Power wiring for motors and installation of starters shall be under Division 26 Electrical.
- C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems shall be under Division 23 of Specifications, installed in accordance with requirements of Division 26. Refer to specification section HVAC Controls – 23 0900, for controls raceways, boxes and wiring to be provided by Division 26.
- D. Motors shall be furnished under Division 23 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.
- E. All low voltage (120V and under) temperature control wiring for Division 23 equipment shall be provided by Division 23, installed in accordance with requirements of Division 26.
- F. All HVAC controls conduit shall be provided by Division 23, installed in accordance with Division 26 requirements.
- G. Phase Failure Relays: All 3 phase motors (air handlers, condensing units, exhaust fans, etc.) shall be provided with a phase failure relay with adjustable voltage range (+/- zero – 25%), adjustable time delay (0 – 5 minutes), and automatic reset. See Specification 26 2913, Division 23 mechanical schedules and Division 23 specifications for more requirements.

1.15 MOTORS

- A. All motors shall be furnished and installed under Division 23 Mechanical and shall be wired under Division 26 Electrical.

1.16 REMOVAL OF RUBBISH

- A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Architect/Engineer.

1.17 QUIET OPERATION AND VIBRATION

- A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.
- B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.18 CLEANING AND ADJUSTMENTS

- A. Upon completion of the work, Contractor shall clean and re-lamp all light fixtures, clean and identify all equipment, adjust and test all equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.
- B. During construction protect all conduit and equipment from damage and dirt. Cap the open ends of all conduit and equipment.

1.19 STORAGE OF MATERIALS

- A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.
- B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.
- C. Provide continuous protection for all equipment already installed.

1.20 WATERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.
- B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.21 TESTS

- A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Architect/Engineer. Provide all instruments, labor and services necessary to conduct tests.
- B. All conductors for the main campus electrical services, all building feeders, plus all conductors 150 amp rated and up, shall be megger tested to test insulation and connection integrity prior to permanent energization.
 - 1. Cables 600 Volts or Less: Cables 600 volts or less in size #1/0 and larger shall be meggered using an industry standard "megger" with 1000V internal generating voltage. Readings shall be recorded and submitted to the Engineer for acceptance prior to energizing same. Values are less than 200 Mohms shall be automatic failure. Submit 5 copies of tabulated megger test values for all cables identified by the feeder name (Panel or equipment tag). Tester shall be a Megger MIT200 Series tester, or equivalent with auto discharge ensures all circuits are safely discharged after testing. 1000 V insulation test range shall have a high voltage warning prior to test voltage being applied.

1.22 INSTRUCTIONS

- A. Fully instruct Owner's personnel in the care and operation of electrical systems, including all communications, sound and fire alarm systems and furnish a letter to the Architect/Engineer advising the particular person(s) who have received such instruction.

1.23 GUARANTEE

- A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Architect/Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one year from date of final acceptance. Any defects appearing within this year period shall be repaired without additional cost to the Owner.

1.24 ACCEPTANCE

- A. Before requesting final inspection:
 - 1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
 - 2. Submit statement that equipment is properly installed, adjusted, tested and operation is satisfactory.
 - 3. Certify in writing to the Architect/Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Architect/Engineer.
 - 4. Submit copy of written guarantees for all equipment.
 - 5. Submit copy of other data as may be outlined in these specifications, including all test data and certifications.
 - 6. See all other project specification sections for close-out and final inspection requirements.
- B. Copies of the above data shall be submitted to the Architect/Engineer prior to requesting final inspection.

1.25 SINGULAR NUMBER

- A. Where any device or part of equipment is referred to in these specifications in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.26 PHASING

- A. Phasing of the work will be required for the interface existing systems and existing building with the new work and demolition of existing systems. Provide all required temporary re-routing and temporary connections to maintain power and systems (power, fire alarm, voice/data network, security, etc.) operation to the existing building while the new work is performed. The contractor shall review all of the contract documents, review all phasing requirements, and visit the site to gain first hand knowledge of the existing conditions and include any work necessary to accomplish the required phasing of the work and phasing of the systems.

1.27 DEMOLITION

- A. The existing administration area of the building will be demolished in this project. All existing power, lighting, voice/data, fire alarm, and other systems shall be completely removed, unless noted otherwise. Remove any and all obsolete or demolished raceways, boxes, circuits, equipment, buildings, including all site electrical, etc. All demolition shall be carefully coordinated with the required phasing. See paragraph 1.26 above.
- B. Existing Plant SCADA systems shall remain and be protected, including all fiber optic cabling and their associated raceways.
- C. Existing telecommunications cabling services (phone and data) that serve the second floor telecom closet shall remain, be protected, and be connected into the new data rack to be provided as part of this project.

1.28 COMMISSIONING

- A. Commissioning of the project will be required for the lighting and HVAC systems, in accordance with the Florida Energy Code. Refer to the commissioning specification, section 23 0800 for more requirements, and other applicable specification sections. Provide all required materials, testing and labor to complete the commissioning procedures.

END OF SECTION 26 05 00

SECTION 26 05 19 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-23 and -26 section making reference to electrical wires and cables specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical wire and cable work is indicated by drawings and schedules.
- B. Types of electrical wire, cable, and connectors specified in this section include the following:
 - 1. Copper conductors.
 - 2. Fixture wires.
 - 3. Flexible cords and cables.
 - 4. Wirenut connectors.
- C. Applications of electrical wire, cable, and connectors required for project are as follows:
 - 1. For motor-branch circuits.
 - 2. For power distribution circuits
 - 3. For lighting circuits
 - 4. For appliance and equipment circuits

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cables.
- D. UL Compliance: Comply with applicable requirements of UL Std 83, "Thermoplastic-Insulated Wires and Cables", and Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors".
- E. UL Compliance: Provide wiring/cabling and connector products which are UL-listed and labeled.
- F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std Pub/ No.'s WC 5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and WC-30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.
- G. IEEE Compliance: Comply with applicable requirements of IEEE Stds 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.
- H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-753. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Wire and Cable:
 - a. American Wire and Cable Co.
 - b. Anaconda-Ericsson Inc; Wire and Cable Div.
 - c. Belden Div; Cooper Industries
 - 2. Connectors:
 - a. AMP, Inc.
 - b. Appleton Electric Co.
 - c. Burndy Corporation
 - d. Thomas and Betts Corp.

2.2 WIRES, CABLES, AND CONNECTORS

- A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20oC (68oF).
- B. Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following UL types, those wires with construction features which fulfill project requirements:
 - 1. Type THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for wet or dry locations requiring a conductor temperature rating of 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
 - 2. Type THHN, THHW, XHHW: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
 - 3. Type XHHW-2: Unless otherwise indicated, all conductors for wet locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
 - 4. Conductors for use at 600 volts or below shall be 600 volt rated. Conductors shall be stranded copper only. Stranded conductors shall terminate in crimp type lugs.
 - 5. Motor circuit branch wiring and associated control wiring: Provide type THHN insulation in dry and damp locations. Provide type THHW insulation in wet locations. All motor wiring to be stranded copper.
 - 6. Wiring for HVAC controls shall be provided in accordance with the control system manufacturer/supplier requirements. Refer to HVAC controls drawings and specifications.
- C. Cables: Provide UL-type factory-fabricated cables of sizes, ampacity ratings, and materials and jacketing/sheathing as indicated for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards.
- D. Connectors:
 - 1. General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following, those types, classes, kinds, and styles of connectors to fulfill project requirements:

- a. Type: Pressure.
- b. Class: Insulated.
- c. Kind: Copper (for Cu to Cu connection).
- d. Style: Butt connection.
- e. Style: Elbow connection.
- f. Style: Combined "T" and straight connection.
- g. Style: "T" connection.
- h. Style: Split-bolt parallel connection.
- i. Style: Tap connection.
- j. Style: Pigtail connection.
- k. Style: Wirenut connection.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UI, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.
- C. Pull conductors simultaneously where more than one conductor is being installed in the same raceway.
- D. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulation.
- E. Use pulling means including, fish tape, cable, rope and basket weave or wire/cable grips which will not damage cables or raceway. Any cable damaged during installation shall be completely replaced.
- F. Keep conductor splices to minimum. No joints shall be made in conductor except at outlet boxes or splice boxes. Newly installed conductors shall not be spliced unless specifically noted on the drawings. Splices shall not be permitted underground. Splices shall not be permitted in low voltage systems, such as fire alarm, intercom, etc.
- G. Install splices and tapes which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced. Below grade splices shall be prohibited unless impossible to avoid. Any allowable below grade splice shall be completely watertight and shall utilize a splice method UL listed for wet locations.
- H. Use splice and tap connectors which are compatible with conductor material.
- I. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B.
- J. At least eight inches (8") of slack wire shall be left in every outlet box whether it be in use, or left for future use.
- K. Color code wiring as follows:
 - 1. 240 volt or 120/208 volt, 3 phase, 4 wire: phase A-black, phase B-red, phase C-blue, neutral-white; ground conductor-green.
 - 2. 277/480 volt, 3 phase, 4 wire: phase A-orange, phase B-brown, phase C-yellow, neutral- white; ground conductor-green.

3. All wire #6 and smaller shall be in the required color. Color coding with tape will not be accepted.
 4. 600 volt, 3 phase, 4 wire: phase A-orange, phase B-brown, phase C-yellow, neutral-white; ground conductor-green.
 5. Neutral – White.
 6. Ground – Green.
 7. Switch legs shall be the same color as the circuit supplying the power to the switch.
- L. Wire and cable boxes and reels shall bear the date of manufacture and must not bear dates by more than one year preceeding contract date.
- M. Minimum conductor sizes, except as specifically identified on the drawings to be larger, shall be as follows:
1. No. 12 - Branch circuits of any kind, except as specified otherwise below.
 2. No. 14 - Signal systems, fire alarm system, unless specifically noted otherwise.
 3. No. 10 - Exit light circuits, emergency circuits, security lighting, security systems circuits and exterior light circuits.

3.2 FIELD QUALITY CONTROL

- A. Prior to energization, test wires and cables for electrical continuity and for short-circuits.

3.3 HVAC CONTROLS

- A. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems shall be under Division 23 of Specifications, installed in accordance with requirements of Division 26. Refer to specification section HVAC Controls – 23 0900, for controls raceways, boxes and wiring to be provided by Division 26.
- B. All low voltage (120V and under) temperature control wiring for Division 23 equipment shall be provided under by Division 26, installed in accordance with requirements of Division 26. Refer to specification section HVAC Controls – 23 0900, for controls raceways, boxes and wiring to be provided by Division 26.**
- C. All HVAC controls conduit shall be furnished and installed by Division 26 in accordance with Division 26 requirements.**

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of grounding work is indicated by drawings and schedules.
- B. Types of grounding specified in this section include the following:
 - 1. Solid grounding
- C. Applications of grounding work in this section including the following:
 - 1. Underground metal water piping
 - 2. Metal building frames
 - 3. Grounding electrodes
 - 4. Grounding rods
 - 5. Service equipment
 - 6. Enclosures
 - 7. Equipment
 - 8. Walkway canopies.
 - 9. Metal Fencing
 - 10. Playcourt structure

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.
- C. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL-listed and labeled.
- D. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical grounding and bonding.
- E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on grounding systems and any accessories.
- B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grounding products which may be incorporated in the work include, but not limited to, the following:
1. Burndy Corp.
 2. Crouse-Hinds Co.
 3. Thomas and Betts Corp.
 4. Erico

2.2 GROUNDING SYSTEMS

- A. Materials and Components:
1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.
- B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
- C. Ground Rods: Copper clad, minimum 3/4" dia. x 10'. Provide longer rods if necessary for required resistivity.
1. All ground rods and grounding conductor connections shall be accessible for inspection. Provide inspections wells (Eritech or equal) for each ground rod where located outside. Interior ground rods shall be located where the connection is visible yet not obstructing access or pathway. Ground rod connections shall be exothermic weld type only. Provide exothermic weld type at all other locations indicated on the drawings.
- D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.
- E. Ground Bars:

A copper ground bar, CADweld, Eritech or equal, shall be provided in each electrical room and each data communications room (MDF & IDF's). Also see Specification 16650. The ground bar shall be bonded to the building grounding system via the building steel or other engineer approved ground. Bond ground bar with grounding electrode conductor size indicated on the power riser diagram, and grounding details.

All electrical rooms shall be provided with a wall mounted copper ground bar to bond all grounding conductors.

1. Ground bar for Main Electrical Rooms shall be a minimum 20" long x 4" wide x 0.25" thick. Erico Part No. EGBA14420CCSKY or approved equal.
2. Ground bar for any sub-electrical rooms shall be a minimum 12" long x 4" wide x 0.25" thick. Erico Part No. EGBA14412AA or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which electrical grounding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING

- A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation", and in accordance with recognized industry practices, to ensure that products comply with requirements and serve intended functions.

- B. Coordinate with other electrical work as necessary to interface installation of electrical grounding system work with other work.
- C. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity. Ground rod connections shall be exothermic weld type only. Provide exothermic weld type at all other locations indicated on the drawings.
- D. All ground connections to water service entrance shall be installed to be exposed and visible for inspection at all times. Insulation shall not be installed over ground connections. Ground rod connections shall be exothermic weld type only. Provide exothermic weld type at all other locations indicated on the drawings.
- E. A water pipe, by itself, is not an adequate grounding electrode and must be supplemented by dual grounding electrodes, a minimum of 10 feet apart, and effectively bonded together. The supplemental ground shall be per Code with the "Footing type electrode" taking precedence when possible.
- F. All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight and shall be made with U.L. listed grounding devices, fittings, bushings, etc.
- G. Duplex receptacles of any amperage shall be grounding type and shall have a separate grounding contact. A separate jumper shall be installed between the grounding terminal on the device and the metallic box. The Contractor may provide U.L. listed self-grounding receptacles in lieu of providing the separate jumper.
- H. Single and duplex receptacles shall have all grounded metal mechanically bonded together. Pressure bonding only is not acceptable.
- I. All receptacles shall be installed with the ground contacts up.
- J. In all cases where flexible metallic conduit, nonmetallic rigid conduit or liquid tight flexible conduit is used, a green wire ground conductor shall be used to provide ground continuity between the equipment of device and the conduit raceway system.
- K. Provide a separate green wire ground conductor for each branch circuit originating from each panelboard. This ground shall be used to ground the device or load fed, and shall be bonded to components of the raceway system, such as junction boxes, starter or disconnect switch enclosures, equipment cases, etc. The green wire ground conductor shall terminate in the panelboard at the green wire ground bus. Ground conductors for branch circuits shall be of size indicated in NEC, except minimum size ground conductor shall be No. 12 AWG.
- L. Each branch feeder originating at the switchboard(s) shall have a green wire ground conductor originating at the ground bus in the switchboard and terminating at the green wire ground bus in the panelboard. This green wire ground conductor shall be of size indicated in NEC except in no instance smaller than No. 8 AWG.
- M. The green wire ground conductor is in addition to the neutral conductor and in no case shall the neutral conductor serve as the grounding means.
- N. Multiple conductors in a single lug not permitted. Each grounding conductor shall terminate in its own terminal lug.
- O. All systems, such as fire alarm, intercom, sound, scoreboard, etc. shall be grounded properly.
- P. Metal walkway canopies shall be grounded with a minimum #4 awg copper insulated ground wire in conduit to a ground rod. Bond to the walkway a minimum of every 100 feet.
- Q. The playcourt structure shall be grounded with a minimum #4 awg copper insulated ground wire in conduit to a ground rod. Bond to playcourt cover steel at every corner.
- R. Each building grounding electrode system shall be tested for resistance to ground. The grounding system resistance shall be 5 ohms or less. Provide written certification of test results. Provide supplemental grounding rods, ground ring or other supplemental grounding to achieve the required results.
 - 1. Grounding Tests: The resistance of electrodes (main service, building feeders, transformers, etc.) shall not exceed 5 ohms and shall be measured by the Contractor before equipment is placed in operation. Testing shall be performed on all grounding electrode installations. Testing shall be 2 point method in accordance with IEEE Standard 81. Submit all ground test readings to the Engineer in tabulated format, indicating each ground test location by main service, panel feeder tag, transformer tag, etc., at substantial completion.

END OF SECTION 26 05 26

SECTION 26 05 29 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is a part of each Division-26 section making reference to electrical supporting devices specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of supports, anchors, sleeves, and seals is indicated by drawings and schedules and/or specified in other Division-26 sections.
- B. Types of supports, anchors, sleeves, and seals specified in this section include the following:
 - 1. Clevis hangers
 - 2. C-clamps
 - 3. I-beam clamps
 - 4. One-hole conduit straps
 - 5. Round steel rods
 - 6. Lead expansion anchors
 - 7. Toggle bolts
 - 8. Wall and floor seals
- C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other Division-26 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of electrical supporting devices.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Installer's option.
- B. Supports: Provide supporting devices of types, sizes, and materials indicated; and having the following construction features:
 - 1. Clevis Hangers: For supporting 2" rigid metal con duit; galvanized steel; with 1/2" dia. hole for round steel rod; approximately 54 pounds per 100 units.
 - 2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.
 - 3. C-Clamps: Black malleable iron; 1/2" rod size; approximately 70 pounds per 100 units.

4. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.
 5. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approximately 7 pounds per 100 units.
 - a. **All exterior conduit straps, anchors, supports, and hardware shall be stainless steel.**
 6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approximately 4 pounds per 100 units.
 7. Round Steel Rod: Black steel; 1/2" dia.; approximately 67 pounds per 100 feet.
 8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.
- C. Anchors: Provide anchors of types, sizes, and materials indicated, with the following construction features:
1. Lead Expansion Anchors: 1/2", approximately 38 pounds per 100 units.
 2. Toggle Bolts: Springhead; 3/16" x 4", approximately 5 pounds per 100 units.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:
1. Abbeon Cal Inc.
 2. Ackerman Johnson Fastening Systems, Inc.
 3. Elcen Metal Products Co.
 4. Ideal Industries, Inc.
 5. Joslyn Mfg. and Supply Co.
 6. McGraw Edison Co.
 7. Rawplug Co., Inc.
 8. Star Expansion Co.
 9. Expansion Bolt Co.
- E. Sleeves and Seals: Provide sleeves and seals, of types, sizes, and materials indicated, with the following construction features:
1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or buting passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.
- F. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 12-gage **hot-dipped galvanized steel**, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings which mate and match U-channel.
1. Fixture hangers
 2. Channel hangers
 3. Thinwall conduit clamps
 4. Rigid conduit clamps
 5. Conduit hangers
 6. U-bolts
 7. All exterior strut support systems, and associated anchors and hardware shall be stainless steel.
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
1. Greenfield Mfg. Co.; Inc.
 2. Midland-Ross Corp.

3. OZ/Gedney Div.; General Signal Corp.
 4. Power-Strut Div.; Van Huffel Tube Corp.
 5. Unistrut Div.; GTE Products Corp.
- H. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal: 3" and smaller, 20-gage; 4" to 6", 16-gage; over 6", 14-gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
 4. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
- I. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified calking material to ensure watertight seal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

- A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices. Tie wires shall not be acceptable as a means of securing conduits or boxes in ceilings, drop ceilings, walls or chases.
- B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.
- C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.
- D. **Important Note: This project is a water plant with some corrosive environmental factors. All exterior steel support systems, conduit straps, anchors, supports, screws, bolts, and all other associated hardware shall be stainless steel.**

END OF SECTION 26 05 29

SECTION 26 05 30 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-23 and 26 section making reference to electrical connections for equipment specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.
- B. Applications of electrical power connections specified in this section include the following:
 - 1. From electrical source to motor starters.
 - 2. From motor starters to motors.
 - 3. To lighting fixtures.
 - 4. To grounds including earthing connections.
 - 5. To equipment of communication, CCTV and alarm systems.
- C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in Division-23 and other Division-26 sections, and are work of this section.
- D. Motor starters and controllers, not furnished as integral part of equipment, are specified in applicable Division-26 sections, and are work of this section.
- E. Refer to Division-23 specification sections and drawings for motor starters and controllers furnished integrally with equipment; not work of this section. Connections to this equipment is work of this section.
- F. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.
- G. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.
- H. Refer to other Division-26 and Division-23 sections for low voltage control system wiring; not work of this section.

1.3 QUALITY ASSURANCE

- A. **Manufacturers:** Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firm with at least 2 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.
- C. **NEC Compliance:** Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.
- D. **IEEE Compliance:** Comply with Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.

- E. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
- F. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and labeled.
- G. ETL Compliance: Provide electrical connection products and materials which are ETL-listed and labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. AMP Incorporated
 - 2. Appleton Electric Co.
 - 3. Arrow-Hart Div., Crouse-Hinds Co.
 - 4. Burndy Corporation
 - 5. General Electric Co.
 - 6. Gould, Inc.
 - 7. Harvey Hubbell Inc.
 - 8. Square D Company
 - 9. Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- B. Metal Conduit, Tubing, and Fittings:
 - 1. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements and comply with NEC requirements for raceways. Provide products complying with Division-26 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing, and fittings:
 - a. Rigid steel conduit.
 - b. Rigid metal conduit fittings.
 - c. Electrical metallic tubing.
 - e. Liquid-tight flexible metal conduit.
 - f. Liquid-tight flexible metal conduit fittings.
 - g. Flexible metal conduit.
 - h. Flexible metal conduit fittings.
- C. Wires, Cables, and Connectors:
 - 1. General: Provide wires, cables, and connectors complying with Division-26 basic electrical materials and methods section "Wires and Cables".
 - 2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying

electrical power. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

3. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA's "Standard of Installation", to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
- D. Provide the following electrical work as work of this section, complying with requirements of Division 23 sections:
 1. Power supply wiring from power source to power connection on chiller, fans, air handling units, pumps, duct heaters, water heaters, air compressor, air dryer, and unit control panels. Include starters, disconnects, time clocks, receptacles and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer. Make all final electrical connections.
- E. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.
- F. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced. No new conductors shall be spliced unless specifically noted on the drawings.
- G. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- H. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.
- I. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.
- J. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.

- K. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:
 - 1. Exterior location.
 - 2. Moist or humid atmosphere where condensate can be expected to accumulate.
 - 3. Corrosive atmosphere.
 - 4. Water spray.
 - 5. Dripping oil, grease, or water, including kitchen areas.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION 26 05 30

SECTION 26 05 33 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of raceway work is indicated by drawings and schedules. Types of raceways specified in this section include the following:
 - 1. Electrical metallic tubing (EMT).
 - 2. Liquid tight flexible metal conduit.
 - 3. Rigid metal conduit. Hot dipped Galvanized Steel
 - 4. Flexible metal conduit.
 - 5. Rigid non-metallic conduit.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical raceway work similar to that required for this project.
- C. Codes and Standards:
 - 1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.
 - 2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL-listed and labeled.
 - 3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each service indicated. Die-cast fittings are not acceptable.
- B. Rigid Galvanized Steel Conduit: Provide rigid steel, hot dipped galvanized, threaded type conforming to FS WW-C-581, ANSI C80.1 and UL 6.
- C. Rigid Metal Conduit Fittings: Hot dipped galvanized, conforming to FS W-F-408, ANSI C80.4.
 - 1. Use compression type fittings for raintight connections.
 - 2. Use compression type fittings for other miscellaneous connections.
- D. Electrical Metallic Tubing (EMT): FS WW-C-563, ANSI C80.3 and UL 797.
- E. EMT Fittings: FS W-F-408, ANSI C80.4. Die cast or malleable iron.

1. Use compression fittings for raintight connections.
 2. Use compression type for concrete type connections.
 3. Use compression type fittings for miscellaneous connections.
 4. Set screw fitting may be used only where conduits and associated fittings are concealed from view.
- F. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC). Shall be Sealtite or equal.
- G. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.
- H. Flexible Metal Conduit: FS WW-C-566 and UL 1. Formed from continuous length of spiral wound, interlocked zinc-coated strip steel.
- I. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.
1. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
 2. 45o or 90o Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2.2 NONMETALLIC CONDUIT

- A. General: Provide nonmetallic conduit, ducts, and fittings of types, sizes, and weights for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements which comply with provisions of NEC for raceways.
- B. Electrical Plastic Conduit:
1. Heavy Wall Conduit: Schedule 40, 90 C, UL-rated, construct of polyvinyl chloride and conforming to NEMA TC-2, for direct burial, or normal above ground use, UL-listed and in conformity with NEC Article 352, ANSI C33.91.
- C. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit or tubing type and material.

2.3 MANUFACTURERS

- A. Subject to compliance with requirements, provide conduit bodies of one of the following:
1. Appleton Electric; Div of Emerson Electric Co.
 2. Arrow-Hart Div; Crouse-Hinds Co.
 3. Bell Electric Div; Square D Co.
 4. Gould, Inc.
 5. Killark Electric Mfg. Co.
 6. O-Z/Gedney Div; General Signal Co.
 7. Spring City Electrical Mfg. Co., or equivalent.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF RACEWAYS

- A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.

- B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

3.3 INSTALLATION OF CONDUITS

- A. General: Install concealed conduits in new construction work, either in walls, slabs, or above hung ceilings. Run conduits concealed in existing work where practical or specifically indicated on the drawings.
 - 1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings, and cabinets to provide electrical continuity and firm mechanical assembly.
 - 2. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
 - 3. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' of linear run or wherever structural expansion joints are crossed.
- B. Conduit Installation: Follow minimum requirements in all areas as follows:
 - 1. Use hot dipped rigid steel galvanized conduit where exposed in the chiller/central plant, where exposed inside the Accelerator Building, where exposed to weather or subject to saturation with liquids, and where exposed to potential mechanical damage. Also use hot dipped galvanized rigid steel conduit for all exposed risers from underground. All rigid elbows and rigid risers to cabinets shall be applied with two coats of bitumastic paint where below grade.
 - a. All feeders and branch circuits serving the chiller yard shall be installed in the existing City constructed concrete utility trench. The trench is open to the atmosphere. Raceways shall be support to the walls of the trench.
 - 2. Use steel EMT above hung ceilings in offices, corridors, toilets, and other areas with hung ceilings. EMT may be used in interior (indoor) mechanical and electrical rooms, except for the central chiller plant and other areas requiring rigid steel galvanized conduit as in (1.) above.
 - 3. Use PVC heavy wall direct buried rated (Schedule 40) when raceways run below grade, under floors on grade or in concrete. All bends and elbows greater than 45 degrees shall be galvanized rigid steel conduit. All risers from underground to cabinets and boxes when conduit is to be exposed shall be rigid steel conduit.
 - 4. Underground telecommunications conduits for voice/data, fire alarm, intercom, and TV may be all direct buried rated Schedule 40 PVC.
 - 5. Conduit in walls to recessed panels and boxes shall be in accordance with NEC. PVC up to first point of termination with 4'-0" maximum in wall and EMT above 4'-0".
 - 6. Use flexible conduit in movable partitions and from outlet boxes to lighting fixtures, and final 24" of connection to motors, control items or any equipment subject to movement or vibration, and in cells of precast concrete panels. Flexible conduit shall not exceed 6 feet long.
 - 7. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:
 - a. Exterior location.
 - b. Moist or humid atmosphere where condensate can be expected to accumulate. Mechanical rooms.
 - c. Corrosive atmosphere.
 - d. Subjected to water spray or dripping oil, water, or grease, including kitchen equipment connections.
 - 8. Use hot-dipped galvanized conduit where conduit is routed outdoors or in any way exposed to weather.
 - 9. Surface mounted raceways in finished areas are not permitted.
 - 10. Electrical contractor will be responsible for the following for all underground conduits:
 - a. Trenching and Excavation
 - b. Backfill
 - c. Compaction

- d. Entrances into and exits from the Administration Building shall be underground, concealed.
- 11. MC cable shall not be permitted.
- C. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
- D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
- E. Minimum conduit size shall be 1/2" unless noted otherwise. Homeruns shall be a minimum 3/4".
- F. Fasten conduit terminations in sheet metal enclosures by two (2) locknuts, and terminate with bushings and grounded. Install locknuts inside and out side enclosure.
- G. Conduits are not to cross pipe shafts, or ventilating duct openings.
- H. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.
- I. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.
- J. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
- K. Install conduits so as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.
- L. Exposed Conduits in Unfinished Areas:
 - 1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.
 - 2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
 - 3. Support all conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed following: up to 1": 6'-0"; 1-1/4" and over: 8'-0". All conduits shall be adequately supported to prevent any noticeable deflection, vibration or rattle.
 - 4. Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.
 - 5. Exposed conduits on the outside of buildings is not permitted.
- M. Conduit Fittings:
 - 1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
 - 2. Bushings for terminating conduits smaller than 1- 1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.
 - 3. Install insulated type bushings for terminating conduits 1-1/4" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.
 - 4. All bushings of standard or insulated type to have screw type grounding terminal.
 - 5. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.
- N. Concealed Conduits:
 - 1. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness.
 - 2. Conduit in concrete slabs: Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond. Conduits must have a minimum of three-quarter inch (3/4") concrete cover.
 - 3. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness. Conduit shall not be run in slabs less than 3 inches thick.
- O. Painting of Conduit & Boxes:
 - 1. Fire Alarm: All new fire alarm conduit, including underground conduit, shall be spot painted red at a minimum of every 4 feet, nominally. Underground conduit shall be spot painted red after it is laid in trench and made up tight. All fire alarm junction boxes shall be painted red.
 - 2. Intercom System: All new junctions boxes above ceiling shall be painted blue.
 - 3. Instructional TV System: All new junction boxes above ceiling shall be painted green.

4. Security System: All new junction boxes above ceiling shall be painted yellow.
5. 208Y/120 volt Power: All new junction boxes above ceiling shall be painted brown.
6. 480Y/277 volt Power: All new junction boxes above ceiling shall be painted orange.
7. Emergency Power (if applicable): All new junction boxes above ceiling shall be painted pink.

P. Provide a continuous yellow marker tape with metallic tracer 6 inches above all new underground conduit.

Q. Underground Duct Banks and Underground Conduits: Shall utilize the City site utility trench. All other underground conduits shall be installed per the National Electrical Code, in accordance with standard industry practices and in accordance with other sections of these specifications. Conduits in duct banks shall be neatly and securely installed in straight lines with manufactured elbows used for all turns and bends. Provide all required trenching, excavation, backfill, compaction, supports, manholes, etc. for a complete installation. Trenching, excavation, backfill and compaction shall be performed in accordance with applicable Division 2 and Division 3 sections of these specifications.

1. Coordinate routing of site raceways with all site piping including new chilled water piping and fire protection piping, plus existing sanitary, storm, and other site utilities. Hand dig in congested areas.

R. Low Voltage Control:

1. Mechanical contractor (Division 23) to provide and install all necessary wire and raceway (EMT conduit) for low voltage control such as thermostats, timers etc., unless specifically shown otherwise on the drawings. Raceways shall be installed in accordance with Division 26 sections. Final wire connections shall be by mechanical contractor.

3.4 INSTALLATION OF RACEWAYS AND WIREWAYS

A. General: Mechanically assemble metal enclosures, and raceways for conductors to form continuous electrical conductor, and connect to electrical boxes, fittings and cabinets as to provide effective electrical continuity and rigid mechanical assembly.

1. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.
2. Install expansion fittings in all raceways wherever structural expansion joints are crossed.
3. Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted.
4. Properly support and anchor raceways for their entire length by structural materials. Raceways are not to span any space unsupported. Supporting conduits from ceiling grid, other conduits, ductwork or other non-structural members will not be permitted.
5. Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.
6. Provide watertight seals in all conduits which cross from one temperature to another temperature extreme, such as coolers and freezers.
7. All fire wall and smoke wall penetrations shall be sealed using a UL Listed fire stopping method. Method shall be submitted and approved by the Architect/Engineer.
8. All empty conduits shall have a 1/8" nylon pull rope installed, including all underground conduits.

3.5 COMMUNICATIONS SYSTEMS RACEWAY

A. Communications systems raceways shall be provided for each voice/data, fire alarm, or other system outlet or device indicated on the drawings.

END OF SECTION 26 05 33

SECTION 26 05 35 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is a part of each Division-26 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings specified in this section include the following:
 - 1. Outlet boxes
 - 2. Junction boxes
 - 3. Pull boxes
 - 4. Floor boxes
 - 5. Bushings
 - 6. Locknuts
 - 7. Knockout closures
 - 8. Manholes and handholes

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
- C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- D. UL Compliance: Comply with applicable requirements UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2, and Pub 250 pertaining to outlet and device boxes, covers, and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

- A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
 - 1. Recessed outlet boxes shall be a minimum 4" square by 2-1/2" deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2" x 4" x 2-1/2" deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.

2. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
- B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.
1. Recessed outlet boxes shall be a minimum 4" square by 2-1/2" deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2" x 4" x 2-1/2" deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.
 2. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:
1. Appleton Electric;
 2. Bell Electric;
 3. Eagle Electric Mfg. Co.; Inc.
 4. Midland-Ross Corp.
 5. OZ/Gedney; General Signal Co.
 6. Pass and Seymour, Inc.
 7. RACO Div.; Harvey Hubbell Inc.
 8. Thomas & Betts Co.
- D. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering raintight outlet boxes which may be incorporated in the work include, but are not limited to, the following:
1. Appleton Electric;
 2. Crouse-Hinds Co.
 3. Bell Electric;
 4. Harvey Hubbell, Inc.
 5. OZ/Gedney; General Signal Co.
 6. RACO Div.
- F. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes; with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.
- G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering junction and pull boxes which may be incorporated in the work include, but are not limited to, the following:
1. Appleton Electric; Emerson Electric Co.
 2. Arrow-Hart Div.; Crouse-Hinds Co.

3. Electric; Square D Company
 4. OZ/Gedney; General Signal Co.
 5. Spring City Electrical Mfg. Co.
- H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering floor boxes which may be incorporated in the work include, but are not limited to, the following:
1. Arrow-Hart Div.; Crouse-Hinds Co.
 2. Harvey Hubbell, Inc.
 3. Midland-Ross Corp.
 4. Spring City Electrical Mfg. Co.
- I. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connections, of types and sizes, to suit respective installation requirements and applications.
- J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bushings, knockout closures, locknuts, and connectors which may be incorporated in the work include, but are not limited to, the following:
1. Arrow-Hart Div.; Crouse-Hinds Co.
 2. Appleton Electric Co.; Emerson Electric Co.
 3. Bell Electric; Square D Co.
 4. Midland-Ross Corp.
 5. OZ/Gedney Co.; General Signal Co.
- K. Manholes and Handholes: Manholes and handholes for exterior use shall be pre-cast concrete with steel traffic rated covers, as manufactured by Brooks or equal. Pre-manufactured composite type boxes (Quazite or approved equal) are permitted where suitable and rated for the use indicated. Manholes and handholes shall be the size necessary for the number of conduits and conductors indicated on the drawings which will enter the enclosure, plus the necessary capacity for the spare conduits and the associated estimated conductor fill. Provide manholes with the appropriate drainage and knockouts for conduits and other necessary access. Traffic covers shall be engraved with the appropriate identification, such as "ELECTRIC" or "COMMUNICATIONS". Provide plastic protective grommet on all conduit ends for all communications systems conduit inside manholes. Fire alarm conduits shall be marked.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- C. Provide weathertight boxes and fittings for interior and exterior locations exposed to weather or moisture. Provide weatherproof boxes for all exterior outlet boxes for power and systems, including fire alarm and intercom system boxes.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- F. Avoid installing boxes back-to-back in walls. Provide not less than 24" (600 mm) separation.
- G. Position recessed outlet boxes accurately to allow for surface finish thickness. All outlet boxes shall be provided with bracket support behind the box for additional structural support. Mounting boxes

directly to the metal framing on one side only is not acceptable. Boxes shall be additionally supported on the back side.

- H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- I. Outlet boxes shall be structurally supported to the metal studs using a back bracket or other additional means of support. Side mounted attachment only to the metal studs is not acceptable.
- J. Each circuit in pull box shall be marked with a tag guide denoting panels which they connect to.
- K. Manholes and handholes shall be installed for all underground conduit installations. The minimum number of manholes and handholes shall be as indicated on the drawings. The contractor shall provide any additional handholes or manholes necessary for ease of installation, code compliance or due to voluntary or required re-routing of the underground conduits at no additional cost to the Owner.

END OF SECTION 26 05 35

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical identification work is indicated by drawings and schedules.
- B. Types of electrical identification work specified in this section include the following:
 - 1. Electrical power, control, and communication conductors.
 - 2. Operational instructions and warnings.
 - 3. Equipment/system identification signs.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.
- C. UL Compliance: Comply with applicable requirements of UL Std 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electrical identification products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Brady, W.H. Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.3 ENGRAVED PLASTIC-LAMINATE SIGNS

- A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, white face and black core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 - 1. Thickness: 1/8", except as otherwise indicated.
 - 2. Fasteners: Self-tapping stainless steel screws or permanent rivets. Contact-type permanent adhesive will not be acceptable.

2.4 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
 1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions and requirements of NEC.
 2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
 3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3.2 OPERATIONAL IDENTIFICATION AND WARNINGS

- A. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and doors of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

3.3 EQUIPMENT/SYSTEM IDENTIFICATION

- A. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/ control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), black lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
 1. Switchboard (including all individual circuit breakers and main breaker), panelboards (including all individual circuit breakers and main breaker on distribution panels), electrical cabinets, disconnect switches and enclosures.
 2. Access panel/doors to electrical facilities. Provide building disconnect signage as indicated on the drawings.
 3. Transformers
 4. Equipment disconnects and starters.
 5. Timeclocks, contactors and lighting controls.
 6. Other control stations, such as purge fans, etc.
- B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION 26 05 53

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:
 - 1. Service-entrance panelboards
 - 2. Power-distribution panelboards
 - 3. Lighting and appliance panelboards
- C. Refer to other Division-26 sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this section. Refer to Section 262813 - Overcurrent Protective Devices for circuit breakers to be installed in panelboards.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to that required for this project.
- C. NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC requirements pertaining to installation of wiring and equipment in hazardous locations.
- D. UL Compliance: Comply with applicable requirements of Std No. 67 "Electric Panelboards", and Stds No.'s 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.
- E. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum), Pub/ No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".
- F. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel", pertaining to panelboards and accessories.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on panelboards. Data must include a complete panel layout indicating the circuit breakers and corresponding circuit numbers. Include ratings of each circuit breaker including short circuit capability. Indicate all options to be supplied with the panelboard. Indicate overall panelboard bus rating and main type and rating. Show complete dimensional information. Any deviation from dimensions shown on the drawings shall be specifically pointed out in the submittal. Indicate the panelboard short circuit capacity rating and specify if this is fully rated. Series ratings are not permitted. Clearly indicate the panel name for each submittal.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):
 - 1. Square D Company
 - 2. General Electric Company
 - 3. Eaton
 - 4. Seimens
- B. All circuit breakers shall be the bolt-on type.

2.2 PANELBOARDS

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.
- B. Power Distribution Panelboards (600 amp and greater or as required for specified branch breakers): Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for copper conductors. Select unit with feeder connecting at top of panel. Equip with copper bus bars with not less than 98% conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide bolt-on type molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated copper grounding bars suitable for bolting to enclosures. Select flush or surface mounted type enclosures, required on the drawings, fabricated by same manufacturer as panelboards, which mate properly with panelboards. Main distribution panels and ALL Service Entrance Panels shall be a power distribution type panel, such as Square D I-Line, GE Spectra Series, or equal. There shall be no limitation to only using 100 amp maximum branch breakers on these panels.
- C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangements shown; with anti-burn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole or multi-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; provide bare copper uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Loadcenters are not acceptable.
- D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with wire gutters and without multiple knockouts. Provide fronts with adjustable trim clamps, doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for flush recessed or surface mounting, as indicated on the drawings. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.
- E. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, cartridge and plug time-delay type fuses, circuit-breakers, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated. All panelboards shall be provided with a separate copper ground bus bar.

- F. Panelboard Ratings: All branch circuit panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Service entrance and distribution panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Series ratings will not be acceptable.
- G. Surge Suppression: Where shown on the drawings, panels shall be provided with an externally mounted surge suppressor.

All panels shall be provided with a surge suppressor mounted externally from the factory panel.

1. All required UL Listings shall be maintained for both the panelboards and the surge suppressors.
2. All warranties shall be maintained for both the panelboards and the surge suppressors.
3. All National Electrical Code requirements shall be maintained for both the panelboards and the surge suppressors.
4. Surge suppressors shall meet the requirements of Specification Section 26 4313. Entire panelboard submittal will be subject to rejection based upon this requirement.
5. Panelboards shall meet the requirements of this specification section and shall be furnished by an approved panelboard manufacturer listed in this section.
6. The panelboards and the surge suppression devices shall be submitted for approval as a package at the same time. One will not be approved without the other.
7. Provide a three pole, circuit breaker to serve the surge suppressor or provide with internal disconnect. Size breaker per surge suppressor manufacturer's recommendation.
8. See Specification Section 26 4313 for more requirements.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS

- A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices, to ensure that products comply with requirements.
- B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B.
- D. Anchor enclosures firmly and securely to walls and structural surfaces, ensuring that they are permanently and mechanically secure and plumb.
- E. Provide properly wired electrical connections within enclosures.
- F. Provide typewritten circuit directory card in panel door upon completion of installation work. All circuit breakers shall be labeled. All labeling shall be in accordance with the final room signage numbering. Use of panel schedules from the original drawings is not acceptable. The contractor shall provide separate and accurate panel schedules for each panel using the final room numbers from the Owner via the final approved signage submittal. Incorrect room numbers on panel schedules shall be changed. NO EXCEPTIONS.

- G. Where panels are mounted flush in the wall, a minimum of three (3) spare 3/4" conduit shall be installed stubbed out a minimum of eight (8) inches above ceiling.
- H. In addition to the three spare stub-up raceways, provide one 3/4" conduit (with pull cord) to the middle of each classroom, above the ceiling, from the nearest local electrical room. Conduit may be looped to up to three classrooms and then home run. Provide a label on the junction box "Future Use". Stub the raceway into the electrical room and label with the classrooms served and provide a pull string.

3.3 GROUNDING

- A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

- A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
- C. Prior to energization, check panelboards for electrical continuity of circuits for short-circuits.
- D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.
- E. Prior to final acceptance completely fill out the circuit directories accurately depicting the equipment connected to each circuit. Circuit directories shall be typewritten.

END OF SECTION 26 24 16

SECTION 26 26 16 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods section, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of circuit and motor disconnect switch work is indicated by drawings and schedules.
- B. Types of circuit and motor disconnect switches in this section include the following:
 - 1. Equipment disconnects.
 - 2. Appliance disconnects.
 - 3. Motor-circuit disconnects.
- C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division-26 Basic Electrical Materials and Methods sections.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
- C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
- D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide circuit and motor disconnect switches which have been UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.
- B. Wiring Diagrams: Submit power and control wiring diagrams for circuit and motor disconnects including connections to power and control panels, and feeders.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include the following:
 - 1. General Electric Co.
 - 2. Square D Company
 - 3. ITE/Seimens

2.2 FABRICATED SWITCHES

- A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible or non-fusible type as indicated, amperes as indicated, 60 Hz, 3-blades, 4-poles, solid neutral; and incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA Type 3R enclosures, where applicable. Provide grounding kit. Provide 240 volt rated switches for 208Y/120 volt systems and 600 volt rated switches for 277Y/480 volt systems.
 - 1. Fuses: Provide fuses for safety switches, sized as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES

- A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches for use with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.
- D. Provide a nameplate indicating the equipment served and protected.

3.2 GROUNDING

- A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.3 FIELD QUALITY CONTROL

- A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.
- B. Painting: repair all scratches to factory painted and primed finish with factory supplied touch-up paint.

END OF SECTION 26 26 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles, including surge suppression type if applicable.
 - 2. Ground-fault circuit interrupters

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm with at least 2 years of successful installation experience on projects utilizing wiring devices similar to those required for this project.
- B. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.
- C. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of wiring devices. Provide wiring devices which are UL-listed and labeled.
- D. IEEE Compliance: Comply with applicable requirements of IEEE Std 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to electrical wiring systems.
- E. NEMA Compliance: Comply with applicable portions of NEMA Stds Pub/No. WD 1, "General-Purpose Wiring Devices", WD 2, "Semiconductor Dimmers for Incandescent Lamps", and WD 5, "Specific,- Purpose Wiring Devices".
- F. FS Compliance: Comply FS W-C-596 (Series) and FS W-S-896 (Series) pertaining to electrical power connectors and toggle switches.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical wiring devices.
 - 1. Receptacles, including surge suppression type if applicable.
 - 2. Light switches.
 - 3. Ground-fault circuit interrupters
 - 4. Occupancy sensors (and vacancy type)
 - 5. Low voltage lighting controls

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following (for each type and rating of wiring device):
 - 1. Hubbell

2. Arrow-Hart Div.
3. Eagle Electric Co.
4. Leviton
5. Pass - Seymour

2.2 FABRICATED WIRING DEVICES

- A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds Pub/No. WD 1. Provide white color devices and stainless steel coverplates, except as otherwise indicated; all color selections to be verified by Contractor with Architect/Engineer prior to ordering.
- B. Receptacles:
 1. Heavy-Duty Duplex: Provide specification grade duplex receptacles, 2-pole, 3-wire, grounding, 20-amperes, 125-volts, with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated. Hubbell or equal.
 - a. All non-UPS receptacles: White.
 - b. All UPS receptacles: Blue.
 2. Ground-Fault Interrupters: Provide "feed-thru" type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of protecting connecting downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and indication; with 5 milliampere ground-fault trip level; equip with NEMA configuration 5-20R. Device must have a positive trip identification and reset. Provide white device.
 3. Special Receptacles: Special configuration receptacles shall be standard NEMA plug configuration as specified on the drawings or as required. Provide heavy duty, specification grade receptacles, with black nylon face and brushed satin stainless steel cover plate.
- C. Switches:
 1. Snap: Provide specification grade, general-duty flush single-pole, quiet type toggle switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handle, and side-wired screw terminals.
 2. 2-way: Provide specification grade, general-duty flush double-pole AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
 3. Three-way: Provide specification grade, general-duty flush 3-way AC quiet type switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, lock type switch handles, sidewired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
 4. Four-way: Provide specification grade, general-duty flush 4-way AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
 5. Touch Snap: Provide soft-touch snap switches, capable of effortless-fingertip operation; single-pole AC quiet, with lighted rocker switch handles; sidewired screw terminals for connecting copper-clad aluminum wire, 20-amperes, 120-277 volts rating. Equip with plaster ears.
 6. Provide low voltage type manual on – auto off switches where indicated with occupancy (or vacancy type – manual on/auto off) sensor control.
 7. Switches to be white, and shall be provided with a stainless steel coverplate.

2.3 WIRING DEVICE ACCESSORIES

- A. Wallplates: Provide wallplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as required. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Provide plates possessing the following additional construction features:
 - 1. Material and Finish: Stainless Steel.
 - 2. Provide permanent label on all receptacles with the panel and circuit number. Handwritten or "sharpie" type labels are not permitted.
- B. Outdoor receptacles that are in locations without protection from the weather shall be provide with a UL listed and approved "in-use" weatherproof cover, and shall be GFI protected. DO NOT use "in-use" type cover in damp locations.

2.4 OCCUPANCY SENSORS AND DAYLIGHT SENSORS

- A. Occupancy sensors shall be dual technology type. Provide occupancy sensors in all spaces indicated on the drawings, and provide ceiling or switch type mounted where indicated. Sensors shall be the type suited for the location. Adjust locations and sensor type (long range where required) for proper performance and as needed to correct any nuisance on or off actions. Sensors shall have adjustable sensitivity, adjustable time periods for on/off, and a test mode. Sensor shall be set at 15 minutes. Acuity Brand Sensorswitch or approved equal.
 - 1. Coordinate sensor type with the low voltage lighting control for manual on – auto off where required.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

- A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.
- D. Install galvanized steel wallplates on any exposed surface mounted devices.
- E. Install wallplates after painting work is completed.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B. Use properly scaled torque indicating hand tool.
- G. Contractor to provide ground fault protective type receptacles for any location within 2'-0" of sinks or other source of water. Feed through protection from one ground fault protected receptacle on a circuit is not acceptable.
- H. Mounting height of boxes for devices as shown on legend, unless otherwise noted on the plan. Refer to architectural drawings to avoid interferences with millwork. Where two or more devices are shown at the same location, use gang box and one face plate. Verify all device locations with Owner prior to rough-in. Exact device locations may be adjusted by the Owner to avoid interferences or for general convenience at no additional cost to the Owner.

3.2 PROTECTION OF WALLPLATES AND RECEPTACLES

- A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING

- A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std 486 A to assure permanent and effective grounds.

3.4 TESTING

- A. Prior to circuitry, test wiring for electrical continuity, for short-circuits and for grounding. Ensure proper polarity of connections is maintained. Prior to energization, test wiring devices to demonstrate compliance with requirements.

3.5 WARRANTY

- A. All wiring devices shall have a minimum one year parts and labor warranty.

END OF SECTION 26 27 26

SECTION 26 28 13 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of overcurrent protective device work is indicated by drawings and schedules.
- B. Types of overcurrent protective devices in this section include the following:
 - 1. Circuit Breakers:
 - a. Air, molded-case, for installation in panels.
 - b. Air, molded-case, for individual, separately enclosed mounting.
 - c. For installation in existing panels.
 - 2. Fuses:
 - a. Class RK1 and RK5, dual-element time-delay.
- C. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices; not work of this section.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of overcurrent protective devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of overcurrent protective devices.
- D. UL Compliance: Comply with applicable requirements of UL 489, "Molded-Case Circuit Breakers and Circuit-Breaker Enclosures", and UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which have been UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. AB 1, AB 2, and SG 3 pertaining to molded-case and low-voltage power type circuit breakers.
- F. FS Compliance: Comply with Federal Specification W-C-375B/GEN pertaining to molded-case circuit breakers.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: amperes, voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristics curves, and mounting requirements.
- B. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
 - 1. Circuit Breakers:
 - a. General Electric Co.
 - b. Square D Co.
 - c. ITE/Seimens
 - 2. Fuses:
 - a. Bussmann Div.; McGraw-Edison Co.
 - b. Gould, Inc.
 - c. Cefco

2.2 CIRCUIT BREAKERS

- A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.
- B. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame size indicated; rated 600 volts or 240 volts as required, 60 Hz, 3-poles with interrupting ratings as shown on drawings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Handle ties are not permitted. Provide push-to-trip button on cover for mechanical tripping circuit breakers. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40oC. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. Circuit breakers shall have the short circuit interrupting rated indicated on the drawings or as required for the short circuit current available.
- C. Molded-Case Circuit Breakers for Installation in Existing Panelboards or Switchboards: Shall meet the same specifications as in Part B above. Shall be manufactured by the same manufacturer as the panelboard or switchboard. When the existing panel or switchboard style is obsolete and the existing circuit breaker type is not available the contractor shall provide a circuit breaker of similar type as existing. The breaker shall be provided with all the required mounting hardware to mount the breaker in the existing space. The breaker shall meet or exceed the ratings of the existing breakers.
- D. Provide all accesories indicated on the drawings, including accesories indicated on the panel schedules, such as shunt trips, ground fault protection, undervoltage trips, etc. Accessories shall be manufactured by the same manufacturer as the circuit breaker.

2.3 FUSES

- A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time/current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.
- B. Class RK5 Dual-Element Time-Delay Fuses: Provide UL Class RK-5 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting motors.
- C. Class RK1 Dual-Element Time-Delay Fuses: Provide UL Class RK-1 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting service entrance or as otherwise noted.

2.4 EXISTING EQUIPMENT

- A. Circuit breakers to be installed in existing equipment shall be manufactured by the existing equipment manufacturer and shall have short circuit interrupting ratings equal to or greater than the existing breakers.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.
- C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.
- D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.
- E. Install fuses, if any, in fused circuit breakers.

3.2 ADJUST AND CLEAN

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 28 13

SECTION 26 29 13 - MOTOR CONTROLLERS AND CONTACTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Division 1 Specification Sections, apply to work of this section.

1.2 SCOPE

- A. The work, apparatus and materials which shall be furnished under these specifications and accompanying drawings shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete electrical systems as indicated on the drawings and as specified herein.
- B. Coordinate all required interlocks with Division 23. Motor starters shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

1.3 DESCRIPTION OF WORK

- A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:
 - 1. Manual motor starters.
 - 2. Combination disconnect/FVNR motor starters.

1.4 QUALITY ASSURANCE

- A. Manufacturers: General Electric, Square D, Allen Bradley.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.
- C. Codes and Standards:
 - 1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.
 - 2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.
 - 3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of motor controller required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 INDIVIDUAL MOTOR CONTROLLERS

- A. Manual motor starters for 115 volts, single phase motors one horsepower and smaller, shall be single pole, horsepower rated switches with thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 609, General Electric CR-101 or Square D Class 2510 with stainless steel cover plates.

- B. Magnetic full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated with three thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 509, General Electric CR-306 or Square D Class 8536. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and electronic overloads (thermal overload "heaters" are not permitted). Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.
- C. Combination magnetic, full voltage starters for three phase motors shall be three pole horsepower rated, magnetically operated contacts, with electronic overloads (thermal overload "heaters" are not permitted). A three pole horsepower rated, fusible disconnect switch shall also be included integral within the enclosure. Provide fuses sized as recommended by the motor manufacturer. Starters shall be Allen-Bradley Bulletin 512, General Electric CR-308 or Square D Class 8538. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and electronic overloads (thermal overload "heaters" are not permitted). Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one. Overloads shall be selected and sized for each specific motor supplied in the field.
- D. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be interlocked so the door cannot be opened without turning the unit off. This interlock shall be capable of being defeated by properly trained personnel.
- E. Provide phase failure relay for all three phase motors, except where provided with the equipment. Relay shall be fully adjustable to open the contacts when any phase to phase or phase to ground voltage is above or below 20% nominal. The relay drop out point shall be adjustable from 0% to 50%. Relay shall be provided with an adjustable time delay of 0 to 120 seconds before opening to avoid nuisance outages. Relay shall be full automatic to open and fully automatic to reset and shall be fully coordinated with the DDC EMS controls. Coordinate with Division 23 for any phase failure device(s) provide with equipment. Any and all phase failure device shall be adjustable as stated above.
- F. IEC type starters and contactors are not acceptable. Provide NEMA listed and approved starters and contactors.

PART 3 - EXECUTION

3.1 MOTOR CONTROLLERS, CONTACTORS AND ASSOCIATED CONTROLS

- A. Unless otherwise indicated, motor controllers shown on the drawings shall be furnished and installed under this section. The full load current and starting characteristics of each motor shall be verified for proper selection of motor over load devices. The Contractor shall furnish and install all steel shapes, etc., necessary for a support of all motor controllers.
- B. Unless otherwise indicated, all control devices, such as thermostats, firestats, etc., shall be installed in place and wired under other sections of the specifications. Coordinate required starter auxiliary contacts and coil voltages for a properly operational system.
- C. Motor controllers shall be installed in accordance with all applicable NEC installation requirements.

3.2 IDENTIFICATION OF EQUIPMENT

- A. Identification shall be provided for all motor controllers installed by the Contractor. Identification shall consist of white laminated plastic plates with black engraved letters.

END OF SECTION 26 29 13

SECTION 26 43 13 - SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes transient voltage surge suppressors for low-voltage (600Volts and below) power equipment
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" transient voltage surge suppressors.
 - 2. Division 26 Section "Panelboards"
 - 3. Division 26 Section "Switchboards"

1.3 SUBMITTALS

- A. Must have ten day prior approval to submit on project.
- B. Request for submittals must be in writing and attached with independent documentation of the following items.
- C. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection notes, wire size and wiring diagram.
 - 1. SPD's with dimensions that exceed the available space to mount the device within the required maximum lead lengths will be rejected and not accepted. Verify maximum lead lengths can be met prior to bid.
- D. Equipment Manual: The manufacturer shall furnish an installation manual with installation notes, start-up and operating instructions for the specified system. Installation instructions shall clearly state whether the system requires an external overcurrent device to maintain the system's UL 1449 listing. SPD requiring external overcurrent devices are not acceptable.
- E. Verification that all SPD are UL 1449 4th Edition (VZCA) listed and rated with a 20kA (In) nominal discharge rating for compliance to UL96A Lightning Protection Master Label and NFPA 780. Also provide UL 1449 4th Edition VPR showing the following maximum VPR (clamping voltage) as follows:
 - 1. 120Vsystem 600V (L-N)
 - 2. 277Vsystem 1200V (L-N)
- F. SPD manufacturer shall provide UL 4th Edition documentation as part of submittal.
- G. Manufacturer's Warranty Statement, showing a 10 year replacment warranty for modules or unit are damaged by transient voltages

1.4 STANDARDS

- A. Underwriters Laboratories 1449 - (UL 1449 4th edition safety standard for surge protection devices)
- B. NEC article 285. National Electrical Code 2011 SPD shall be labeled with a minimum 200kAIC rating.
- C. NFPA 780 Standard for the installation of lightning protection systems
- D. UL96A - Lightning Protection System Master Label
- E. IEEE (Institute of Electrical and Electronic Engineering Inc.) C62.41.1 and C62.41.2, IEEE C62.45, IEEE C62.33 & C62.35

- F. All manufacturers must comply with above listed standards and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

- A. Placing into Service: Do not energize or connect service entrance equipment, panel boards, control terminals, or data terminals to their sources until the surge protective devices are installed and connected.
- B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:
 1. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent
 2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
 3. Humidity: 0 to 85 percent, non-condensing.
 4. Altitude: Less than 20,000 feet (6000 m) above sea level.

1.7 COORDINATION

- A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.
- B. Coordinate surge protective devices with Division 26 Section "Panelboards" and "Switchboards".

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer shall provide a product warranty for a period of not less than ten (10) years from date of installation. Warranty shall cover unlimited replacement of TVSS modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of TVSS for not less than five (5) years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. PQ Protection
- B. APT

2.2 SERVICE ENTRANCE SUPPRESSORS (SPD1)

Panel Amperage	≥3,000Amps	2500-1600Amps	1200-400Amps
Service Entrance	400kA/Modular	300kA/modular	200kA/modular

- A. Provide service entrance rated, UL Type 1 SPD's as shown and indicated on contract drawings.
- B. Minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.
- C. SPD's shall be a multi-stage parallel connected device.

- D. SPD’s UL 1449 4th Edition VPR (clamping voltage) shall be a maximum rating of:
 - 1. 120Vsystem 700V (L-N)
 - 2. 277Vsystem 1200V (L-N)
- E. SPD’s shall mount external to the panel; internally mounted SPD’s are not acceptable.
- F. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.
- G. SPD shall be modular design with field replaceable modules per phase and per mode.
- H. SPD shall have redundant status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.
- I. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.
- J. SPD’s relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.
- K. SPD’s that are limited to being connected to breaker whether or not an integral disconnect switch is supplied do not meet the intent of this specification.
- L. SPD’s shall have an UL “In” rating (nominal discharge) of 20kA.
- M. SPD shall have dry contacts for remote monitoring capabilities.
- N. Service Entrance SPD’s shall have audible alarms and surge counters.
- O. SPD’s shall have a metal, NEMA 4 rated enclosure.
- P. SPD shall be designed and equipped with integral disconnecting means.
- Q. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

2.3 DISTRIBUTION, BRANCH PANEL AND/OR AUXILLARY PANELS (SPD2)

Panel Amperage	1200-800A	600A	400-100A
Distribution	200kA	200kA	200kA
Branch Panels		100kA	100kA

- A. Provide UL Type 2 SPD’s as shown and indicated on contract drawings.
- B. SPD’s minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.
- C. SPD’s shall be a multi-stage parallel connected device.
- D. SPD’s shall mount external to the panel; internally mounted SPD’s are not acceptable.
- E. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.
- F. SPD shall be a compact, non-modular design
- G. SPD shall have per phase status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.
- H. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.
- I. SPD’s relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.
- J. SPD’s shall have an UL “In” rating (nominal discharge) of 20kA.
- K. SPD shall have dry contacts for remote monitoring capabilities.

- L. SPD's shall have a metal, NEMA 4 rated enclosure
- M. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

- A. Review all installation information in manufacturer's installation manual prior to installing SPD's.
- B. Verify all voltages before connecting to avoid injury and damage to equipment.
- C. The SPD's shall be installed external to switchboard, distribution and panelboard.
- D. Internally mounted SPD's will not be accepted.
- E. The service entrance/switchboard/switchgear SPD's shall be installed with the shortest lead length possible and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.
- F. The distribution, panelboard and auxiliary SPD's shall be installed with the shortest lead length possible from the panel it is protecting and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.
- G. Ground resistance shall be 5 Ohms or less.
- H. Refer to manufacturer's installation manual for further installation details.

3.2 FIELD QUALITY CONTROL

A INSTALLATION

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with manufacturers' installation instruction requirements and recommendations.

B MANUFACTURERS FIELD SERVICE

1. Engage a factory authorized service representative to inspect equipment installation. Report results in writing
2. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION 26 43 13

SECTION 26 51 00 - INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.
- B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Extent of interior lighting fixture, also known as luminaire, work is indicated by drawings and schedules.
- B. Types of interior lighting fixtures in this section include the following:
 - 1. LED
- C. Applications of interior lighting fixtures required for project including the following:
 - 1. General lighting
 - 2. Emergency lighting

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of interior lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with interior lighting fixture work similar to that required for project.
- C. NEC Compliance: Comply with NEC as applicable to installation and construction of interior building lighting fixtures.
- D. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. LE 1 and LE 2 pertaining to lighting equipment.
- E. ANSI/IES Compliance: Comply with ANSI 132.1 pertaining to interior lighting fixtures.
- F. ANSI/UL Compliance: Comply with ANSI/UL standards pertaining to interior lighting fixtures for hazardous locations.
- G. UL Compliance: Provide interior lighting fixtures which have been UL-listed and labeled.
- H. CBM Labels: Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on interior building lighting fixtures, lamps and ballasts.
- B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. If requested by the Engineer, samples shall be submitted to determine compliance and equivalence, at no cost to the owner or architect/engineer. If requested by the Engineer, point-by-point footcandle calculations shall be submitted to determine compliance and equivalence. Criteria for calculations (max/min, reflectances, dirt depreciation, etc., shall be obtained from the Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers/Catalog Numbers: Subject to compliance with requirements, provide fixtures manufactured by manufacturers as indicated on the fixture schedule. Catalog numbers given on the fixture schedule are intended to provide the general description of the required fixture and its quality. Additional accessories, mounting hardware, options, etc., not specifically described by the catalog number but required for a properly operating and installed fixture or as described by additional notation on the drawings or in the specifications, shall be provided.
 - 1. Substitutions shall be prior approved by an official addendum. Complete shop drawings shall be submitted for review for consideration of substitutions.

2.2 INTERIOR LIGHTING FIXTURES

- A. General: Provide luminaires, of sizes, types, and ratings indicated; complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring.
 - 1. LED light fixtures shall be rated/tested to LM-79 standards.
- B. Drivers shall be supplied with automatically resetting thermal overloads.
- C. LED Lamp Drivers: Provide drivers, capable of operating lamp types indicated and that are compatible with the LED lamps. Drivers shall be capable of dimming the LED lamps where indicated on the drawings.
- D. Lamps: Provide lamps of the wattage and types specified on the drawings. Coordinate lamp type with driver for a complete operational, energy saving lighting system which will operate for the expected lamp and driver life.
 - 1. Lamp and driver/ballast combinations shall have no noticeable flicker or delayed starting, including dimming ballast combinations. Lamps shall start instantaneously and illuminate immediately. Any delay in starting will not be acceptable and the lamp and/or ballast shall be replaced.
 - 2. LED lamps shall produce the minimum lumens indicated at the color temperature specified and shall be tested/listed/rated in accordance with LM-80 as a minimum.
- E. Ballast/Lamp Assembly Warranty: Provide a minimum five year ballast guarantee, along with a five year lamp guarantee. This warranty shall be provided as an assembly with the ballast and lamp manufacturer agreeing to provide the required warranty with the associated ballast or lamp.

PART 3 - EXECUTION

3.1 INSTALLATION OF INTERIOR LIGHTING FIXTURES

- A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
- B. Coordinate with other electrical work as appropriate to properly interface installation of interior lighting fixtures with other work.
- C. Fasten fixtures securely to building structural support; and ensure that pendant fixtures are plumb and level. Provide all required mounting hardware and steel channel to supplement structural support where necessary. Fixtures shall not be supported from ductwork, piping, conduits, ceiling grid or any other non-structural building member.
- D. Coordinate fixture installation with mechanical duct work, diffusers, return grilles, communication systems devices, etc., to avoid any interferences.

3.2 ADJUST AND CLEAN

- A. Clean interior lighting fixtures of dirt and debris upon completion of installation
- B. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect/Engineer.
- C. Refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to time of Substantial Completion.

3.4 GROUNDING

- A. Provide tight equipment grounding connections for each interior lighting fixture installation.

END OF SECTION 26 51 00

SECTION 26 56 00 - EXTERIOR BUILDING LUMINAIRES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Extent of exterior luminaire work is indicated by drawings and schedules.
- B. Types of exterior luminaires in this section include the following:
 - 1. LED
- C. Applications of exterior luminaires required for project including the following:
 - 1. Outdoor supplementary lighting

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of exterior luminaires of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with exterior luminaire work similar to that required for project.
- C. NEC Compliance: Comply with NEC as applicable to installation and construction of exterior building luminaires.
- D. UL Compliance: Provide exterior luminaires which are UL-listed and labeled.
- E. CBM Labels: Provide ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS

- A. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters. Full specification data sheets.
- B. Details of attaching luminaires and accessories.
- C. Details of installation and construction.
- D. Luminaire materials.
- E. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - 1. Submit complete point-by-point photometric calculations utilizing the LLF and LDD factors provided by the engineer.
 - 2. Testing Agency Certified Data: Photometric data shall be certified by a qualified independent testing agency.
 - 3. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - 4. Submit all lamp and driver information complete
- F. LED drivers, including energy-efficiency data.
- G. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.

- H. Materials, dimensions, and finishes of poles.
- I. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
- J. Anchor bolts for poles, if applicable.
- K. When applicable, submit manufactured poles and pole foundations. Provide complete lighting pole and pole base shop drawings for each pole type and location, where the location conditions differ. Provide pole and pole base wind load rating calculations signed and sealed by a Florida registered professional engineer.
 - 1. Provide geotechnical soil testing or other tests if necessary or required by the engineer of record for the poles and pole bases, where applicable.
- L. Wiring Diagrams: For control and switching wiring.
- M. Samples: The Engineer shall be provided with a sample of each fixture for review upon request. Each Sample shall include lamps and drivers. Lamps and drivers may be requested separately. The samples shall be retrieved by the contractor upon completion of review.
- N. Point-by-point foot-candle calculations shall be provided for all exterior lighting, including driveways, parking area, property line, walkway canopy, and stairs.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers/Catalog Numbers: Subject to compliance with requirements, provide fixtures manufactured by manufacturers as indicated on the fixture schedule. Catalog numbers given on the fixture schedule are intended to provide the general description of the required fixture and its quality. Additional accessories, mounting hardware, options, etc., not specifically described by the catalog number but required for a properly operating and installed fixture or as described by additional notation on the drawings or in the specifications, shall be provided.
 - 1. Point-by-point calculations will be required to be submitted. Engineer will provide the design criteria and maintenance factors.
 - 2. Substitutions will not be considered without a full submittal package, complete with point-by-point calculations. Any substitutions that are considered must be prior approved by written addendum.

2.2 EXTERIOR LUMINAIRES

- A. General: Provide luminaires, of sizes, types, and ratings indicated; complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, drivers/ballasts, starters and wiring. The level of quality, general material, and manufacturing of the fixtures shall be as per the basis of design fixture, lamp and ballast and driver selection.
 - 1. LED luminaires shall be rated/tested to LM-79 standards.
- B. LED lamps shall be rated for a minimum 50,000 hours, or as indicated on the drawings, and shall be rated/tested/listed in accordance with LM-80 as a minimum. Provide lamps and drivers suitable for use in the outdoor environment.
- C. Poles: Site lighting poles shall be installed straight and plumb, and shall be as scheduled on the drawings. The pole and base shall be rated for the prevailing wind load as required by the Florida Building Code for the EPA of the luminaires and bracket arm, for the current version in affect at the time the project bids. Structural design for wind load ratings of the pole and base shall be performed by a Florida registered professional engineer and signed and sealed proof of compliance shall be submitted with the lighting shop drawings.
- D. Driver/Lamp Warranty: Provide a minimum five year lamp and ballast/driver (where applicable) guarantee. This warranty shall be provided as an assembly with the ballast and lamp manufacturer agreeing to provide the required warranty with the associated ballast or lamp.

- E. Fixture and Pole Warranty: Provide a minimum five year luminaire and light pole guarantee, including bollards. This warranty shall be provided as an assembly with the ballast and lamp, or separately from the driver & lamp.

PART 3 - EXECUTION

3.1 INSTALLATION OF EXTERIOR LUMINAIRES

- A. Install exterior luminaires at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that luminaires fulfill requirements.
- B. Coordinate with other electrical work as appropriate to properly interface installation of exterior luminaires with other work.
- C. Fasten fixtures securely to required structural supports; and check to ensure that solid pendant fixtures are plumb.
- D. All poles shall be straight and plumb.
- E. Complete all control connections, including connection to the HVAC controls for on/off controls. Test all controls, program all timing for on/off periods based upon the Owner;s request, and verify proper operation.

3.2 ADJUST AND CLEAN

- A. Clean exterior luminaires of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL

- A. Upon completion of installation of exterior luminaires, and after building circuitry, apply electrical energy to luminaires to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in exterior luminaires which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Engineer.
- C. Refer to Division 00 sections for the replacement/restoration of lamps in exterior luminaires, where used for temporary lighting prior to time of Substantial Completion.

3.4 GROUNDING

- A. Provide tight equipment grounding connections for each exterior luminaire installation.

3.5 COMMISSIONING

- A. Commissioning of the project will be required in accordance with the Florida Energy Code. Refer to the commissioning specification, section 23 0800 for more requirements, and other applicable specification sections. Provide all required materials, testing and labor to complete the commissioning procedures.

END OF SECTION 26 56 00

SECTION 27 15 00 - VOICE/DATA NETWORK CABLING INFRASTRUCTURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Divisions 00 Specification Sections, apply to this Section.
- B. All Division 26 sections apply to work in this section.

1.2 SCOPE

- A. Furnish and install a complete and properly functioning communication network for voice and data to include all cabling, distribution equipment and associated electronics as specified and/or required. Internal building wiring shall be Unshielded Twisted Cable (UTP) as specified for data, voice, and auxiliary applications. Network termination and connections shall be compliant of Category 6 requirements for 200 MHz (minimum) data transmission and in accordance with EIA/TIA TSB-40, EIA/TIA 568, AND EIA/TIA 569.

IMPORTANT NOTE: The existing Voice-over-IP telephone system shall be existing to remain, including all equipment (VoIP servers, hand sets, etc.), and all phone cabling. Test the telephone system at the contractors option to detect and existing system trouble or problems. Any problems during or after construction shall be corrected prior to substantial completion.

- B. It is the responsibility of any contractor bidding on this requirement to verify the contents of this specification.
- C. Contractor shall provide a Category 6 cabling system for Data connectivity and Voice connectivity.
- D. APPLICABLE STANDARDS:
 - 1. TIA/EIA-568-C. Standard for Installing Commercial Building Telecommunications Cabling
 - 2. TIA/EIA-569-C. Commercial Building Standard for Telecommunications Pathways and Spaces
 - 3. TIA/EIA-568-C.1. Commercial Building Telecommunication Standard.
 - 4. TIA/EIA-606A Administration standard for the Telecommunications Infrastructure of Commercial Buildings.
 - 5. TIA/EIA-607A Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 6. TIA/EIA-TSB-36, TSB-40, and TSB-95. Additional Cable Specifications for Unshielded Twisted-Pair Cables.
 - 7. TIA/EIA-TSB 67 and 72. Transmission Performance Specifications for Unshielded Twisted-Pair cabling systems.
 - 8. IEEE Standards 802.3 and 802.5.
 - 9. NEC- NATIONAL ELECTRIC CODE, NFPA 70 - 2014
 - 10. UL Listed- Underwriters Laboratories Listed
 - 11. NEMA- National Electrical Manufacturer's Association
 - 12. ANSI- American National Standards Institute

1.3 RELATED DOCUMENTS

- A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.

1.4 DESCRIPTION

- A. General: Furnish and install complete with all accessories a Category 6, Premise Distribution System (PDS). The PDS system shall serve as a vehicle for transport of data, video, and voice telephony signals throughout the building from designated demarcation points, (MDF's and IDF's) to outlets located at various desk, workstation and other locations as indicated on the contract drawings and described herein.

- B. General: The system shall utilize a network of multi-mode fiber optic cable, and unshielded data and voice, riser, tie and station cables. Cables and terminations shall be provided and located as shown and in the quantities indicated on the drawings. Cables shall terminate on rack mounted Fiber Distribution Centers (FDC's), modular patch panels, and station outlets located as shown on the drawings. All cables, and terminations shall be identified at all locations. All cables shall be terminated in a numeric sequence at all termination locations, per Owner standards where applicable. All terminations shall comply with, and be tested to TIA/EIA 568A, TSB-67, TSB-95, and Category 6 standards for Category 6 installations.
- C. Telephone Company Connectivity:
- D. Data Services: Wiring utilized for data communications shall originate at Owner provided hubs and switches in vertical free standing equipment racks the MDF and at individual IDF's.
- E. Work Included: All wiring, terminations and patch bays between these designated demarcation points and outlet locations designated on the plans shall be considered part of the contract. All materials needed to support the PDS and conform to a fully compliant TIA/EIA 568A, 569, 606 installation shall be furnished and installed by the PDS contractor.
- F. All electronics (hubs, file servers) will be owner furnished, owner installed. Contractor shall coordinate and schedule the Owner for installation. The contractor is responsible for notification and scheduling with a minimum of a one week notice. All testing of fiber and Cat 6 cabling shall be complete and acceptable prior to installation of switches.

1.5 CONTRACTOR QUALIFICATIONS

- A. General: The contractor selected for the Project must be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning the Project.
- B. The Contractor directly responsible for this work shall be a Premise Distribution Systems installer who is, and who has been, regularly engaged in the providing and installation of commercial and industrial telecommunications wiring systems of this type and size for at least the immediate past five years. Any sub-contractor who will assist the PDS contractor in performance of this work, shall have the same training and certification as the PDS contractor, with no less than 3 years of prior experience with installations of this type and size. References shall be provided upon request.
- C. Certification: The contractor's Project Manager shall possess a current BICSI Registered Communications Distribution Designer (RCDD) certificate. All shop drawings submitted by the contractor shall be signed by the RCDD.
- D. Experience: The Contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of optical fiber and category 6 premise distribution systems and have personnel who are adequately trained in the use of such tools and equipment.
- E. The selected contractor will have a minimum of three, (3) BICSI trained Level 1 technicians and at least one (1) BICSI, R.C.D.D.s on staff, or at the minimum, and must be a paid employee of the company and shall only be employed by the one communications contractor bidding the project.
- F. The following manufacturers cabling systems are approved for the work of this section:
 - 1. Hubbell Premise Wiring
 - 2. Leviton, Panduit, or engineer prior approved.
- G. The contractor shall be an authorized and certified Hubbell Premise Wiring cabling installer, Panduit Certified or Leviton Certified, and shall have been so for a period of no less than 1 year.

1.6 SUBMITTALS

- A. General: Submittals shall include manufacturers cut sheets for all proposed equipment including, but not limited to, the following:
 - 1. All wire and cable.
 - 2. All outlets, jacks, connectors and required tooling.

3. All termination system components for each cable type.
4. All MDF/IDF equipment frame types.
5. All cable raceway cable and cable suspension components.
6. All grounding and surge suppression system components.
7. All patch panels, wire management, FDC's, and all miscellaneous MDF/IDF rack equipment.
8. Cable tray
9. Rack elevation details and labeling scheme
10. Detailed test procedure to be implemented, including all tests to be conducted and list of equipment used.

1.7 SPECIAL REQUIREMENTS FOR CABLE ROUTING AND INSTALLATION

- A. Ceiling Spaces: The PDS wiring in this project will be free-wired above ceilings, except for fiber cabling. All communications cabling used throughout this project shall comply with the requirements as outlined in the National Electric Code (NEC) article 800. All Cat 6 and fiber cabling shall bare CMP/OFNP/RISER and/or appropriate markings for the environment in which they are installed, and shall be plenum rated.
- B. Cable Pathway: In suspended ceiling areas where duct or conduits are not available, the Contractor shall bundle, in bundles of 50 or less, station wiring with Velcro cable ties snug, but not deforming the cable geometry (plastic ties are not acceptable). The cable bundling shall be supported via category 6 compliant J-hooks attached to the building structure and framework at a maximum of four (4) foot intervals. The contractor shall adhere to the manufacturers' requirements for bending radius and pulling tension of all data (cooper and Fiber optic), voice cables.
- C. Protection: Sealing of openings between floors, through rated fire and smoke walls, for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of this contractor's work. Any openings created by or for this contractor and left unused shall also be sealed as part of this work. All fire wall penetrations shall be via an approved UL listed fire rated assembly.
- D. Damage: The contractor shall be responsible for any damage to any surfaces or work disrupted as a result of his work. Repair of surfaces including painting and ceiling tile replacement shall be included as part of this contract.

PART 2 - PRODUCTS

2.1 OUTLETS:

- A. All connectivity components shall be Hubbell Premise Wiring unless otherwise noted.
- B. Following are the Work Area Outlet Designations and product selection. There shall be no deviations from this portion of the specifications. Catalog numbers are intended to give the general requirement for each outlet type. Provide all additional inserts, connectors, jacks, faceplates accessories as required for a complete outlet in accordance with these specifications and details on the drawings.
 1. Provide Category 6 outlets for all connectors: Hubbell Xcelerator HXJ series
 2. Wireless Access Points:
 - a. One Cat 6 cable located above the ceiling tile terminated in a double gang box (biscuit), with a 4 foot service loop.

2.2 CATEGORY 6 HORIZONTAL CABLING:

- A. Cabling shall be Mohawk, Category 6, VersaLAN for all cables, projector outlets, wireless access points, voice/data outlets. Cable shall be tested to no less than 250 MHz and each individual 1000' reel shall have an independent test result sent with it.

2.3 COPPER CROSS CONNECTION:

- A. For cross connection at Category 6 patch panels in the MDF and IDF locations patch cords shall be used. Patch cords shall also be used at outlets for connecting the data and voice devices. One patch cord shall be provided for each terminated end of CAT 6 cables – 100% of all terminated ports. The patch cords shall be provided in quantities of 3 foot and 6 foot lengths. Patch cords for data shall be yellow, voice shall be blue, and wireless access points shall be green.
 - 1. Refer to voice/data riser for the minimum quantities of patch cords.
 - 2. Also provide a 10 foot workstation patch cord connection cable for 100% of all ports supplied on the project.
 - 2. Provide a signed receipt from the Owner's representative who received the patch cords. The receipt shall clearly note the quantities delivered and to whom they were delivered, the place, and the date.
- B. Cross connection of horizontal Category 6 cabling shall be made on the following patch panels: P/N: P6E48U, 48 port Category 6 patch panel and P6E24U: 24 port Category 6 patch panel.
- C. Category 6 cabling for Wireless Access Point connections shall terminate on CAT 6 jacks in the WA outlet and on dedicated patch panels located in the respective MDF/IDF. These cables and the jacks at the WA outlet shall be white. White Icons P/N: IWH100 shall be installed above the jacks in the patch panels for identification. Outlet shall be installed in a box (biscuit) suspended above the ceiling with a 4 foot service loop.
 - 1. All wireless access point devices (the actual access point equipment) will be furnished and installed by the Owner.
- D. Category 6 cabling for voice and data shall terminate on Category 6 jacks in the outlets and on corresponding voice or data patch panels located in the respective MDF/IDF. The voice/data cables and the jacks at the faceplates shall be white. White Icons P/N: IWH100 shall be installed above the jacks in the patch panels for identification.
- G. Category 6 voice cable for elevators shall be cross connected on 110 style termination blocks P/N: 6110FTK64WL located on the backboard in the respective MDF/IDF.

2.4 FIBER OPTIC CABLING (NOT APPLICABLE)

2.5 FIBER OPTIC CROSS CONNECTION (NOT APPLICABLE):

2.6 CABLE SUPPORT SYSTEM

- A. General - Station cables shall be suspended by prefabricated J-hooks specifically designed for proposed Category 6 cabling. J-hooks shall be permanently attached to the structure using drop wire/rod suspension, beam flange, or wall mount. The J-hooks shall feature a wide base loop with smooth curves to eliminate snag potential and cable deformation. Free-wired cables shall be bundled and loosely tie-wrapped 24 inches on centered maximum. Do not bundle more than 48 cables maximum.
- B. Listings: J-hooks shall be suitable for Cat 6 cabling and in accordance with NEC, TIA/EIA requirements for structured cabling systems. All cable supports shall be U.L. listed.
- C. Design selection: Category 6 j-hooks by Erico, Caddy or equal.
- D. Provide plenum rated Velcro tie-wraps.

2.7 COPPER TIE/RISER CABLING (NOT APPLICABLE)

2.8 SITE COPPER CABLE PROTECTION UNITS (NOT APPLICABLE)

2.9 EQUIPMENT RACKS AND CABINETS

- A. General: The telecom room shall be equipped with a rack providing 19" EIA mounting rails floor mounted to house owner-provided equipment and contractor provided termination bays for the multiple cable types. Floor mounted racks shall be mounted on an isolation pad and utilize non-conductive washers to secure the rack to the floor. Floor mounted open racks shall be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement. All racks shall be bonded to the telecom ground bar using a standard ground lug and #6 jacketed green cable.

- B. Design Selection: (Floor Mtd. Rack): Hubbell: HPW84RR19. Approved Equal: Great Lakes or B-Line. Must be capable of supporting 750 pounds.
 - C. Rack Accessories: Each equipment rack and cabinet shall be provided with the following accessories:
 - 1. Vertical cable organizers with hinged cover: Hubbell VC76H (Floor Racks Only).
 - 2. Horizontal cable organizer with hinged cover: Hubbell HC219CE3NH. (1 rack unit)
 - 3. Mounting hardware: 45 units per rack. Cabinets shall be as indicated.
 - 4. Surge power strip: Hubbell MCCPSS19 (1 rack unit), or equivalent.
 - 5. Single sided solid shelf - rack mounted – Great Lakes 7206-EIA (floor rack only)
 - 6. Cable tray cable runway above rack and supported to wall. (floor rack only)
 - D. Cable Routing: Ensure that station cables will be routed into the rear station Cable Manager, neatly organized and terminated onto the patch panel following TIA/EIA-568-B, 569 termination guidelines. Require that a horizontal cable manager be installed above and below any patch panel installed on the rack. Patch panels and front/rear cable manages are to be installed in alternating order on the rack. Also, ensure that on 48 port patch panels, the cables terminated to the top 24 ports is neatly routed through the cable manager mounted above the patch panel and conversely those terminated on the lower 24 ports are routed through the cable manager mounted below the patch panel. This routing method allows easier moves, adds and changes at a later date.
- 2.10 UNSPECIFIED EQUIPMENT AND MATERIAL
- A. Any item of equipment or material not specifically addressed on the contract drawings or in this document and required to provide a complete and functional installation shall be provided in a level of quality consistent with other specified items. Such additional items should be contained and listed in project submittals. (i.e. ¾” plywood, anchors, paint supplies, conduit and fittings). Backboard shall be approved for use in building with fire retardant paint on all sides.
- 2.11 GROUNDING SYSTEM AND CONDUCTORS
- A. Grounding shall conform to ANSI/TIA/EIA 607(A) - Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI-568 and manufacturer’s grounding requirements as minimum
 - B. A #6 AWG stranded copper wire cable shall be extended between new ground bars located at each IDF. The building steel, the equipment rack, and all surge suppressors, protectors and metallic cabinets shall be bonded to the ground bar via a #6 AWG stranded copper cable and U.L. approved connecting hardware.
 - C. The grounding of one rack in an IDF or MDF with multiple racks networked will not be acceptable. Each rack must be grounded with an individual #6 green grounding conductor back to the grounding bus bar in the IDF or MDF. In case of a black enameled rack, paint must be removed at point of contact with grounding lug to ensure proper contact. Ladder rack attached to racks and/or any other metallic pathway must also be grounded accordingly.
 - D. The telecom room/IDF shall be provided with a copper ground bar mounted on the wall adjacent to the racks.
 - 1. Ground bar for IDF shall be a minimum 12” long x 4” wide x 0.25” thick. Erico Part No. EGBA14412AA or approved equal.
- 2.12 COMMUNICATIONS BACKBOARDS
- A. Backboard shall meet all EIA/TIA requirements for fireproofing and safety.
 - B. Design Selection: Ready Spec Backboards, P/N RB-A Series (GRAY). Coordinate the exact size required with the existing conditions
 - C. Any contractor not following the safety requirements per the NFPA and EIA/TIA shall be terminated immediately from this project. The communications backboards are required due to their strict manufacturing and fire proofing systems. If the communications contractor can provide and provide that their supplied backboards meet and/or exceed the above Design Selection’s UL approved criteria, then those backboards shall be approved.

2.13 UTILITY COORDINATION

- A. Provided by the City.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Components of the premise distribution system shall be installed in a neat, workmanlike manner consistent with the best telephone and data practices.
- B. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the building.
- C. Identification markings and systems shall be uniform.
- D. EIA 568B.1 wiring codes as shown on the drawings shall standardize all twisted pair wiring.

3.2 CATEGORY 6 CABLE INSTALLATION

- A. Installation of Category 6 UTP cable shall be in accordance with TIA/EIA and BICSI guidelines. Cable installation and terminations that do not comply with the above, shall be replaced by the contractor at the owner's discretion at no additional charge.
 - 1. The maximum pulling tension shall not exceed 25 pounds to avoid stretching the conductors.
 - 2. The minimum bend radius of the cable shall not be less than 1".
 - 3. The cable shall be installed without kinks or twists and the application of cable ties shall not deform the cable bundle. All communications cabling, once it has entered the IDF/MDF facility shall be bundled and managed by the use of Velcro strips.
 - 4. Strip back only as much cable jacket as is required to terminate the cable and minimize the amount of untwisting in a pair, as a result of the termination do not exceed 0.5 in. Final jacket removal lengths shall not exceed 0.5 in. from the 110 IDC termination points of both the individual outlet jack and patch panel 110 IDC.

3.3 LABELING:

- A. Provide the following:
 - 1. Use labels on the face of data patch panels. Provide facility assignment records in a protective cover in each data cabinet location that is specific to the facilities terminated therein.
 - 2. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
 - 3. Label cables, patch panels, and patch cables with the Cabinet ID, and the port ID for which it corresponds and originates in at one end and the reverse for the other end.

For Example:

- a. Mark up floor plans showing outlet locations, type, and cable markings of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.

3.4 CABLE LENGTH AND SERVICE LOOPS

- A. All cable runs shall contain service loops prior to the termination point. Provide a 48 inch service loop in the ceiling above each outlet, at the outlet. Service loops in the IDF's shall consist of a 25 foot coiled loop for backbone fiber, 15 foot service loop for voice backbone riser cable (where applicable) and a 4 foot service loop for all station cables located in the cable ladder tray above the equipment rack.
- B. Category 6 Cable maximum length of 275 feet shall include the spare cable lengths listed above. Should link length exceed this maximum length coordinate routing and/or spare cable length prior to commencing cable installation.

3.5 SUPPORT AND ROUTING OF CABLES

- A. Station cables and tie cables used in this system are to be free wired within ceiling spaces. Cables shall be routed through these spaces at right angles to electrical power circuits and supported only from the structure. Riser and tie cables shall be extended between IDF's utilizing conduit runs as shown on the

drawing. In case of cable raceway, station cables should be routed in and bundled in a neat and professional manner.

- B. Use of ceiling tiles, grid or hanger wires for support of PDS cables shall be prohibited.
- C. The PDS system contractor shall install a complete set of supporting J-hooks and other supporting hardware for this system as part of the PDS contract. All supporting hardware shall be submitted to the engineer for approval prior to installation. Free-wired cables shall be bundled and loosely tie-wrapped 24 inches on centered maximum. Do not bundle more than 48 cables maximum.

3.6 FIRE AND SMOKE PARTITION PENETRATIONS

- A. Conduit sleeves shall be provided as a means of routing cables between various communications rooms and multi floor buildings. Openings in sleeves and conduits used for the PDS system cables and those which remain (empty) spare shall be sealed with a U.L. approved fireproof, removable safety material.
- B. Sleeves that pass vertically from floor to floor, shall be sealed in a similar manner using an approved re-enterrable system.
- C. Additional penetrations through rated assemblies necessary for passage of PDS wiring shall be made using an approved method and permanently sealed after installation of cables.

3.7 NETWORK ELECTRONICS

- A. Provide system start-up supervision and assistance with Owner and Owner's equipment supplier.
- B. Ethernet Switching, including POE IP Intercom switches
 - 1. To be selected and installed by Owner
- C. 10/100BaseT Intelligent Ethernet Hubs
 - 1. To be selected and installed by Owner
- D. Be ready for installation and activation of Owner Network Electronics no later than 2 weeks prior to substantial completion. Issue a written request to the Owner when ready for network equipment and to allow 7 days for installation and activation. The contractor is responsible for any delay in achieving substantial completion that results from failure to meet this requirement. A working data network is a requirement for substantial acceptance

3.8 UNINTERRUPTIBLE POWER SUPPLY (UPS)

- A. Power Backup
 - 1. APC Uninterruptible Power Supplies UPS's furnished by contractor and are to be installed in all MDF/IDF's. MDF shall be a minimum 1500 va each.
 - 2. IDF's shall be a minimum 750 va each. APC Smart UPS Part No. SUA750RM1U.

3.9 TESTING OF WIRING ACCURACY

- A. TESTING: Contractor shall test each Data/Voice UTP cable at 250 Mhz. The Engineer shall be present during all tests. Notify the engineer one week prior to testing. The PDS contractor shall provide a table of test results on the As-Built drawings.
 - 1. HORIZONTAL UTP CABLE: Each horizontal cable run shall be tested twice, first test shall be a basic link test configuration, which includes patch panel, UTP cable and work station jack. The cable tester shall be set for basic link test parameters before testing. The second test shall be a channel link configuration, which includes the patch cord, patch panel, UTP cable, workstation jack and workstation cord. The cable tester shall be set for channel link parameters before testing. Each proposed category 6 cable shall be tested using a Level III tester compliant with TSB-95/ADDENDUM 5 to ANSI/TIA/EIA 568B.1 specifications for testing of proposed category 6 cabling. Tester shall be as manufactured by Hewlett-Packard, approval of other testers shall be based on 100% compliance with TSB-95/ADDENDUM 5 tester requirements. No tester will be approved with out meeting these requirements. Prior to testing UTP runs, the tester shall be calibrated per manufacturer guidelines. The correct cable NVP shall be entered into tester to assure proper length and attenuation readings. During channel link testing the patch cords and workstation cords shall be the same as those provided by the contractor per this specification. Each channel link test shall

include one patch cord and one workstation cord, with no cord used twice. (Note: It is mandatory at this time to use manufacture specific Basic Link test probes and Basic Channel test probes to properly certify a proposed Category 6 installation).

B. Category 6 UTP cable testing shall include test frequencies to 250Mhz:

1. Cable length
2. Wire map
3. Attenuation
4. Pair to Pair Near end cross talk
5. Power Sum Near end cross talk
6. Return loss
7. Pair to Pair Equal level far end cross talk
8. Power Sum Equal level far end cross talk
9. Delay
 - a. Delay skew
 - b. Propagation Delay
10. Ambient Noise
11. Provide owner with a copy of test results in text format (PDF) on CD.
12. Provide owner with software to view test results, to be the same format as tester used for certification.
13. A certification report, signed by the RCDD, shall be provided

3.10 TESTING OF FIBER OPTIC CABLE (ONLY IF APPLICABLE)

A. TESTING: Contractor shall test each fiber strand of each cable. The owner reserves the right to have a representative present during all or a portion of the testing.

1. FIBER-OPTIC BACKBONE CABLE: Each fiber in every backbone cable run shall be tested with a light source and optical power meter as manufactured by Noyes Fiber Systems or Hewlett-Packard. Multimode fiber testing shall be I.A.W. TIA/EIA-526-14; method B. Each multi-mode fiber shall be tested at both 850 and 1310nm in both directions. Per IEEE 802.3z, maximum fiber strand attenuation shall not exceed 2.38dB @ 850nm with a modal bandwidth of 160 MHz-km and 2.35dB @ 1310nm with a modal bandwidth of 500 MHz-km. Backbone lengths shall be verified with an OTDR as manufactured by Noyes Fiber Systems or Hewlett-Packard. Per IEEE 802.3z, maximum distance shall not exceed 220 meters to support LAN equipment operating at 850nm over fiber strands with modal bandwidth of 160 MHz-km. Maximum distance shall not exceed 550 meters to support LAN equipment operating at 1310nm over fiber strands with modal bandwidth of 500 MHz-km.

B. A certification report, signed by the RCDD, shall be provided listing both the calculated and measure loss for each fiber optic circuit and submitted with the test results as called for above.

C. Tests as follows:

1. Tests:
 - a. Measure and record normalized fiber loss at operating wavelength in dB/km.
 - b. Detect and record point faults or discontinuities.
 - c. Measure and record overall length of cable.
2. Documentation of testing shall include:
 - a. Wavelength.
 - b. Fiber type.
 - c. Fiber manufacturer and cable model number.
 - d. Cable manufacturers' attenuation specifications.
 - e. Cable manufacturers' bandwidth specification.
 - f. Measurement direction.
 - g. Test equipment and serial numbers (with date of last calibration).

- h. Date of each test.
 - i. Reference setup.
 - j. Name of technician(s) performing testing.
 - k. Prepare and deliver to Engineer administration documents as detailed elsewhere.
3. OTDR trace(s) shall be submitted with request for substantial completion.
 4. Provide owner with a copy of each test result in text format (PDF) on CD.
 5. Provide owner with software for viewing test results, same as used by tester, if required.

3.11 IP VOICE/TELEPHONE AND INTERCOM SYSTEM

- A. The Owner's existing IP voice/telephone system shall be integrated and installed into the network cabling infrastructure plant, as one complete, integrated, tested, and operational system.

3.12 AS-BUILT DOCUMENTATION

- A. As-built documentation shall be provided as part of the contract. As-built drawings shall be a complete set of hard copy floor plans with all outlets shown and numbered as installed. All cable routings (trunk lines) and elevations of each MDF/IDF indicating outlet, tie and riser cable terminations shall be required. Termination sequences and a bill of materials for all equipment shall be in table form inserted on the associated floor plan sheet with that MDF/IDF elevation detail. All cable test results along with documented testing procedures shall be included in this information. All addendum information or project revisions resulting in drawing changes that occur during the construction period shall be documented and included in the as-built material. All required as-built documentation is mandatory and shall be required prior to project closeout.

3.13 WIRING ADMINISTRATION

- A. The contractor shall prepare a record of each station cable termination. Administration shall include a unique identifying number or name for each station cable. Each port/position on a cross connect block or patch panels shall also have a unique number or name.
- B. Each IDF shall have an index/catalog identifying all station cable entering and/or leaving IDF.
- C. All station cables shall also be identified by typewritten or equivalent label located at each style of faceplate.
- D. Number or name protocol shall be as determined by Owner and Engineer.

3.14 WARRANTY OF INSTALLATION

- A. The contractor shall and does hereby warrant all materials and equipment furnished under this scope of work to be free from defects and function or operate satisfactorily for a period of one (1) year from substantial completion of this project. Additionally, provide the owner with any equipment warranties that exceed the minimum stipulated one-year warranty.
- B. In addition to the one year warranty by the contractor, a manufacturer's 25 year (minimum) application independent warranty program must be provided for the structured cabling system installed. Along with testing and certification documentation, a site registration certificate must be provided at the completion of work. Reflecting said installation name, date, site registration number, certified contractor name and the authorized signatures of the represented connectivity product manufacturers.

3.15 TELEPHONE SYSTEM

IMPORTANT NOTE: The existing telephone system shall be existing to remain, including all equipment (VoIP servers, hand sets, etc.), and all phone backbone cabling. Test the telephone system at the contractors option to detect and existing system trouble or problems. Any problems during or after construction shall be corrected prior to substantial completion.

END OF SECTION 27 15 00

SECTION 28 13 00 - ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide a scalable, open architecture access control system for security management, including engineering, supply, installation, and activation.

1.2 RELATED SECTIONS

- A. Section 260500 – Common Work Results for Electrical, for interface and coordination with building electrical systems and distribution.
- B. Section 08 71 00 – Door Hardware

1.3 REFERENCES

- A. Reference Standards: Systems specified in this section must meet or exceed the following requirements:
 - 1. Federal Communications Commission (FCC)
 - a. FCC Part 15 – Radio Frequency Device
 - b. FCC Part 68 – Connection of Terminal Equipment to the Telephone Network
 - 2. Underwriters Laboratories (UL):
 - a. UL294 – Access Control Systems Units
 - 3. Electronic Industries Alliance (EIA):
 - a. RS232C – Interface between Data Terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange
 - b. RS485 – Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multi-Point Systems
 - 4. Federal Information Processing Standards (FIPS)

1.4 ACCESS CONTROL SYSTEM

- A. Provide a complete IP based electronic access control system (otherwise called Security Management System) by Genetec GSC Synergis inclusive of cables, connectors, hardware, and materials required for a complete and workable access control system. Work includes the furnishing and installation of all equipment, materials, labor, and tools required for system installation, and a final terminations and system commissioning performed by a factory certified technician. Access Control System shall be fully coordinated with Door Hardware components furnished under Section 087100 “Finish Hardware”. Provide and install one (1) Dell Inspiron workstation to run the Client Software. Locate as directed by Owner. Provide 30 proximity cards. Program the entire access control system and instruct the Owner how to use the Client Workstation.
- B. Provide all required licenses for software, door controllers, readers, etc.

1.5 SUBMITTALS

- A. Manufacturer’s Product Data: Submit the manufacturer’s data sheets indicating systems and components proposed for use.

Provide a bill of material indicating all parts, wiring, software, licenses, etc., to be provided. Indicate any additional hardware, software or other materials that are expected to be provided by others.
- B. Shop Drawings: Submit complete shop drawings indicating system components, wiring diagrams and load calculations.

Provide a point-to-point shop drawing that indicates the communications, control, and power supply wiring for each door. Indicate locations for all devices and equipment. Provide a wiring and rough-in diagram for each typical door.

- C. Record Drawings: During construction maintain record drawings indicating location of equipment and wiring. Submit an electronic version of record drawings for the Security Management System not later than Substantial Completion of the project.
- D. Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, customized to the Security Management System installed. Include system and operator manuals.
- E. Maintenance Service Agreement: Submit a sample copy of the manufacturer's maintenance service agreement, including cost and services for a two year period for Owner's review.

1.6 QUALITY ASSURANCE

- A. Manufacturers
 - 1. A minimum of five years' experience in manufacturing and design of access control systems using the Security Management System (SMS) Electronic Access Control System.
- B. Suppliers
 - 1. Authorized by Genetec Synergis Security Management System (SMS) Electronic Access Control System as resellers. The following is a list of current authorized dealers:
 - a. Convergent Technologies
- C. Installers
 - 1. Minimum of 1 technician that has successfully completed Genetec Synergis Electronic Access Control System certification training shall be present at the project site to supervise installation and test system during commissioning and set-up.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packaging. Store and handle in accordance with the manufacturer's requirements.

1.8 WARRANTY

- A. Provide Manufacturer's warranty covering [1] year from date of shipment for replacement or repair of defective equipment.

1.9 DEFINITIONS

- A. Access Card: A coded employee card, usually the size of a credit card, recognizable to the access control system and read by a reader to allow access. It can be used for photo identification of the cardholder and for other data collection purposes. Card technologies include magnetic strips, wiegand-effect, proximity (active/passive), barium ferrite, smart/intelligent cards, and NFC enable applications on mobile devices.
- B. Access Control System: An interconnected set of controllers, managing the entrance and exit of people through secure areas.
- C. Access Level: The door or combination of doors and/or barriers an individual is authorized to pass through.
- D. Anti-Pass back (Anti-Tailgating): This feature protects against more than one person using the same card or number. It defines each system card reader and card ID number as IN, OUT or other. Once a card is granted access to an IN reader, it must be presented to an OUT reader before another IN reader access is granted. Cards will continue to have access to all authorized OTHER readers.
- E. Alarm: A signal that indicates a problem.
- F. Alarm input: A device that is monitored by the access control panel. An alarm signal will be generated if the device is activated.
- G. Badge: Badge is a template or a design for creating a card. WIN-PAK includes a full-featured badge layout utility for designing, creating, and printing badges. Badge design includes magnetic stripe encoding, bar coding, signatures, and so on.
- H. Bar Code: A method of encoding information using lines and blank spaces of varying size and thickness to represent alphanumeric characters.

- I. Biometrics: A general term for the verification of individuals using unique biological characteristics (i.e. fingerprints, hand geometry, voice analysis, the retinal pattern in the eye).
- J. Card and Card Holder: A card is an identity proof of a person and a card holder is a person who holds the card. Multiple cards can be assigned to a single card holder to provide different access.
- K. Controller: A microprocessor based circuit board that manages access to a secure area. The controller receives information that it uses to determine through which doors and at what times cardholders are granted access to secure areas. Based on that information, the controller can lock/unlock doors, sound alarms, and communicate status to a host computer.
- L. Card Reader: A device that retrieves information stored on an access card and transmits that information to a controller.
- M. Digital Video Recorder (DVR): A security system device that records the video from the surveillance cameras (IP and Analog) on a hard disk.
- N. Door: A generic term for a securable entry way. In many access control applications a "door" may actually be a gate, turnstile, elevator door, or similar device.
- O. Duress: Forcing a person to provide access to a secure area against that person's wishes.
- P. Input: An electronic sensor on a controller that detects a change of state in a device outside the controller.
- Q. Keypad: An alphanumeric grid which allows a user to enter an identification code. A flat device which has buttons that may be pressed in a sequence to send data to a controller, and which differs from a typewriter-like computer board.
- R. Output Relay: A device that changes its state upon receiving a signal from a controller. Typically the state change prompts an action outside of the controller such as activating or inactivating a device. The auxiliary relays found in access control panels or NODES that control external devices.
- S. Shunt Time: The length of time a door open alarm is suppressed (shunted) after a valid card access or free egress request. This time should be just enough to allow a card user to open a door or gate, pass through, and then close it.
- T. Time Schedules: Schedules that allow cards to function or not function depending on the time of day. This is used to limit access to the facility. The schedule may include not only time but which days of the week a card is valid.
- U. Video Management System (VMS): An enterprise-class video management and storage solution.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Genetec Synergis IP Based Electronic Access Control System.

2.2 ACCESS CONTROL ELECTRONIC LOCKS AND CARD READERS

- A. Provide wall mounted, multi-technology proximity Card Readers, with key pad, as manufactured by HID Prox, RPK-40. Readers shall be furnished and installed by this contractor (Division 28).

2.3 ACCESS CONTROL SYSTEM SOFTWARE

- A. System Communication: The system shall provide a Communication Interface Module (CIM) to issue all database changes to the Reader Controllers. This software module also shall have the ability to gather all the information (transactions) for the Reader Controller and store it in proper history files. The CIM shall reside on any workstation or File Server. There may be multiple CIM modules running at one time, each managing up to 64 separate Reader Controllers.
- B. Communication Management: The system shall also facilitate a System Processor (SP) that controls the communication between the File Server and the workstations. This application shall be in charge of directing transactions and alarms to proper workstations. This program also shall be capable to sending alarms of e-mail messages to legitimate e-mail accounts.
- C. Access Rights: The software shall allow for assignment of the access rights to badge holders. The access right is the combination of what "Areas" the badge holder can go and when the badge holder can

go there (time zones). Each badge holder can be allowed multiple “Area” access rights. Each access right shall be allowed to have a different time schedule. The software shall automatically load the proper access rights into each field panel without any operator intervention. There shall be no limits on the number of access rights (who goes where and when) by the system design.

- D. Event Triggers: The system shall have the ability to associate output events, i.e. relay activation in relation to system events, i.e. access requests and contact input change of state.
- E. System Management: The system shall provide a tool that will integrate and categorize the Owner's data and at the same time the user shall be able to simultaneously monitor and maintain a secure working environment. The system shall contain the definition of all intelligent field control panels (i.e. Reader controllers (RCs) card readers, contact inputs etc.). There must be a provision to label each device with at least a 20 character alphanumeric description to easily identify each component. Conceptually, the system software shall be designed to allow operation management and control at many “tiered levels” with the apex of control being in the hands of a “Global Manager”. The “Global Manager” shall have administrative authority for the entire system and delegate administrative responsibility.
- F. System Security: The system shall be secure both in its operation and administration. The system shall offer ample flexibility for the administrator to establish and customize any level of security by assigning security permissions to group of operators. The individual operator shall be able to log into the system using a unique operator ID and a password associated with that operator ID. The “Administrator” of the system may set the rules and standards for Login requirements.
- G. Reports: Assigning appropriate privileges to operators shall restrict generating or running reports.
- H. Badge Layouts: Badge layouts shall be protected by assigning appropriate privileges.
- I. Start-Up Programs: The programs such as CIM, SP, CCTV, History Archive, Universal Triggers, Alarm Monitor and Alarm graphics etc. (both Alarm Monitor and Alarm Graphics shall be added as the startup programs at the same time) shall be set to launch before the operator is logged in to the system. The administrator shall be able to select any programs from the above list and set to launch before the operator log in.
- J. Cardholder Creation and Management: The system shall provide an easy to use interface to add, delete or modify cardholder information effortlessly. With the use of wizards the user shall be able to input and retrieve data regarding area access, active, retired badges and cardholder categories etc.
- K. Badge Layout: The visual representation of the badge, as it shall be printed. Allow multiple credentials per cardholder
- L. Person with Disability (Special Access Privileges): The system shall allow additional access to doors for physical challenged cardholders. When a new cardholder is added to the system, the operator shall have an option to select a specific field with Person with Disability option. The event triggers for LED Green transaction shall be programmed in the System Manager. The Duration field shall allow for a longer transaction (e.g. 30 seconds versus standard 5 seconds)
- M. Assigning Area Access: Provide functionality to define cardholder's access to selected Areas and Area Sets.
- N. Portrait Capture: Provide ability to store digital images for each cardholder. However, there should be the provision to have multiple badges per cardholder.
- O. Portrait Enhancement: The system shall provide a functionality to enhance the cardholder portrait. There shall be a utility, which enables the operator to improve the quality of the picture by adjusting the brightness.
- P. Portrait Exporting: Provide a functionality to export cardholder portraits in JPEG format. The operator shall be able to copy the files to a folder that exists outside the system software. The operator shall be able to select the directory to which the portraits are being exported. When exporting files the user shall be provided with an option to decide the file naming convention.
- Q. Signature Capture: Provide ability to store a digital signature of the cardholder. Each cardholder shall have only one signature attached to his/her record.
- R. User Definable Fields: The system shall provide a functionality to create additional User Definable Fields that shall be applicable in certain programs. A few examples will be Nickname, Social Security Number, etc. When defining a user definable field, the system shall give the user the flexibility of deciding whether the field is pertinent only to cardholder database or guest pass database or both.

- S. Designing Badge Layouts: The system shall provide functionality to design and print badge layouts. The features of the badge-designing program shall include the ability to use background color, background image, inserting pictures, logos, signatures and a variety of fields that the operator uses while defining a cardholder. The program shall also support magnetic strip encoding. The program shall provide three tracks for the magnetic stripe cards. The user shall be able to insert the cardholder information like PIN or Encoded ID or hard coded text (the user shall be able to type in the text) into these fields. Each field added shall be separated with a separator symbol. The badge layouts shall be secured using the system security. Only operators with Read/Write permissions shall be able to modify or create badge layouts. The permissions set to a badge layout shall affect an operator using the badge layout in the Cardholder Definition, Badge Queue and Guest Pass System.
- T. Printing Badges: Owner shall provide for printing of badges from a separate system.

2.4 TRANSACTION AND ALARM MONITORING

- A. Transaction Monitoring: The software shall include a real time display of all or selected transactions in the system as they occur. The screen shall display substantial information about each transaction (e.g. cardholder, card number, access granted or denied, location etc.). The operator shall be able to see only those user definable fields, which he has been given permission to view.
- B. Viewing Previous Transactions: There shall also be the ability to view previous (past) transactions from the transaction monitor screen. The user shall have the ability to set a “filter” that shall select what type of event(s) what cardholder(s) and what devices(s) shall appear while viewing pas transactions. When the scrolling process is complete, the operator shall be able to invoke a single keystroke or mouse click to return to the current transaction screen. Links: To Cardholder Database and Recorded Video.
- C. Alarm Processing and Monitoring: The system shall permit the programming of alarms (contact inputs) with a priority level and instructions, if any, to be followed when the alarm occurs. The system shall offer up to 126 levels of priority, with 1 being the highest and 126 the lowest. Each alarm point shall be addressed within the system by a unique user defined name. The operator shall be able to view, acknowledge and secure alarms. The system shall alert the user immediately upon receipt of an alarm by popping up an alarm window on-screen. The alarm window shall contain the following information: cardholder or contact input information, date, time, transaction description, priority level, device number, and reader controller number, and how many unacknowledged alarms are in memory. The system shall allow the configuration of different door alarms based on the activity at that door. The alarm shall be caused by any of the following activities.
 1. Door Forced Open
 2. Door Held Open
 3. Access Under Duress
 4. Access Denied
- D. Alarm Graphics: A graphical depiction of the alarm shall be presented to the operator in the form of a blueprint and/or illustrative photo of the scene of the alarm. Icons may be imposed on the graphics whereby the operator can right click on the point of alarm and have immediate access to all of the following:
 1. Audio Playback
 2. Text Interface
 3. Live Video
 4. Digital Video Playback
 5. Manual Overrides
 6. Monitor Device Status
- E. Manual and Automatic Overrides: The system shall allow manual and automatic control of selected output points. Manual panel control shall include energize/de-energize options for output points as well as the option to override any schedule changes in the output state.
- F. Manual Overrides: The system shall provide a facility to manually change a device’s normal function, possibly to allow temporary access to any area, exit in an emergency situation or as an added security to an access or exit point.
- G. Automatic Overrides: The system shall also provide a way to override certain tasks automatically at a regular basis such as unlocking the main lobby door during normal business hours. In the event of

computer or network failure, Automatic Device Override programming shall continue to function as programmed in the off-line mode. The off-line programming shall be universal and intelligent.

- H. Access Control Templates: The system shall provide a quick and easy way to assign area access rights to guests. This shall be implemented via the use of access control templates. Each template shall contain conventional description and notes fields. Then the user shall be able to select either the hours after sign-in option or the time of sign-in day option.
- I. Report Generation: The system software shall be able to generate reports of Alarm History, Archive History, Audit Trail, Cardholder Transactions, Guest Pass History and Transaction History Reports. The user may print and/or export these reports to other applications, store to disk or send to mail recipients, as well.
- J. Scheduled Reports: The system shall allow the user to create pre-defined reports on a scheduled basis. The system shall provide the user with a wizard that guides him/her through the process of selecting a report, creating a schedule and assigning a printer. The user shall be able to generate the reports and print them on a weekly or daily basis at a specific time period.
- K. System Wide Features:
 - 1. Context Sensitive Help: This system shall also provide context sensitive help for all the modules. It shall be accessed from the Help>Contents and Index. The help for a specific module shall be accessed by clicking F1 from the specific module.
- L. Wizards: The software shall provide step-by-step wizards for easy programming of the entire system.
 - 1. Pull down Menus: The system programming shall be menu driven and include tool bar icon for all major options in the menu.
 - 2. Onscreen Help: The software shall provide onscreen description of all the actions that the user has to perform while programming the system.
- M. Search and Advanced Find – The system shall include a simple search feature for the user to easily find data in the database. The system shall also provide functionality that helps the user to further customize the search criteria and make the search more precise. The user shall be able to use Boolean logic to run highly precise and more complex searches. The system shall also be capable of saving the search criteria that the user defines.
 - 1. Right Click Options: The system shall provide right click options for most of the system functionalities.

2.5 SYSTEM PROGRAMMING

- A. The contractor shall furnish and install all hardware, software, devices and components to meet the performance and functional requirements described in these contract documents. Include all items required, whether or not individually specified, to ensure a completely operation integrated Security Protection system. The contractor must complete all database entry (unless directed otherwise by owner or their representative). And provide the owner with training on cardholder entry, as well as all system programming. No additional costs shall be allowed to make the system operational or to meet specifications.

2.6 SYSTEM ARCHITECTURE

- A. Primary function is to regulate access through specific portals to Secured areas. Utilize card technology as its primary access device. Surge Protection Components must be protected from voltage surges originating externally to equipment housing and entering through power, communication, signal control, or sensing leads. Must also include surge protection for external wiring of each conductor-entry connection to components. Power: Any special power treatment required, such as filtering or spike elimination that may be required for proper operation and protection of the access control system (ACS), shall be provided with the system. Step down power supply with battery backup of at least 4 hours. Backup Power: ACS equipment power shall be supplied from a UPS system, which shall be tied to emergency building power circuits, if available. The UPS shall power the equipment including but not limited to, the Embedded Controller, electronic locks and low power supplies for a minimum of 4 hours.

2.7 SYSTEM SOFTWARE AND SERVER SOFTWARE BASE PACKAGE

- A. Base Package shall include:
 - 1. Transaction and Alarm monitoring / routing

2. Cardholder management (includes special access needs)
3. Unlimited card holder capacity
4. 64 card reader capacity
5. Unlimited alarm capacity
6. Unlimited operator capacity
7. Manage online and off line locks/readers
8. Portrait Capture and card production (printers not included)
9. Video and Camera control (not included)
10. Guest Pass management and badge creation (printer not included)
11. Complete Auditing/Reporting capabilities.
12. Auto scheduling of predefined reports
13. Enrollment reader capable.
14. Unless otherwise specified by owner, server shall be provided by the Security Contractor. Minimum requirements are MS Window Server Operating System (Current Edition), network card, DVD/CD-RW, 22" flat screen monitor, 104-key keyboard and mouse. Server shall be approved by Synergis.

2.8 SYSTEM HARDWARE

- A. Reader Controller: Reader controllers shall be independently programmed, intelligent devices, which shall be able to make decisions and store transactions at the local level. Provide required reader controllers for one read head and up to 16 reader capacity, and field configurable by standard system software. Mercury Intelligent Controller, Model EP1502 with required MR52 I/O devices. Provide open architecture interface to allow for non-proprietary access control device connection via Synergis Cloud Link Controller (POE).
- B. Reader Interface: Reader Interface Modules shall be provided as manufactured by HID. Each reader in the system shall have a reader interface panel able to connect to the controller via RS-485 protocol, able to support the proximity Wiegand technology. Provide HID VertX V1000 reader interface module, HID VertX V2000 16 input monitor interface module, and HID VertX V3000 12 out control interface module.
- C. All readers, interfaces, controllers, and any required expansion boards shall be furnished and installed by Division 28.

2.9 POWER SUPPLIES

- A. Provide multi-output power supply for access controls complete with batteries and battery charger, as manufactured by Altronix. Model AL600ULACMCB, or as otherwise required. Power supplies shall be furnished and installed by Division 28 and all power supply wiring shall be provided by Division 28. Provide quantity and sizes of power supplies required.
- B. Provide in cabinet with hinged cover with lock-down screws and optional key lock. Provide complete with battery back-up.

2.10 DOOR HARDWARE

- A. Refer to Architectural Door Schedule and Specification Section 087100 for the Doors that are required to be provided with access control. Mount access control head equipment in first floor electrical room (103A) of the building. For the Administration Office access control, provide a button for access control door release of the door that leads from Corridor 103 to the Administration Offices Corridor 100. The release button shall be mounted at the reception desk on the second floor, Room 222.
- B. Power transfer devices at the doors shall be furnished and installed by Division 08, with the power supply wiring provided and connected by this contractor (Division 28).

2.11 MISCELLANEOUS EQUIPMENT AND DEVICES

- A. Provide all other required miscellaneous equipment and devices, such as request to exit devices (REX) and door contacts.

2.12 PROXIMITY CARDS

- A. Provide proximity card that are compatible with the readers. HID ISOProx II, HID #1386LGGMV.

2.13 EQUIPMENT LIST

- A. Provide the following minimum equipment, with quantities as required.

Category	Description	Manufacturer	Model #
Access Control System	Genetec GSC Synergis		GSC-Sy-S
Workstation	Dell Inspiron with network card, DVD/CD-RW, 22" flat screen monitor, 104-key keyboard, and mouse	Dell	Inspiron
Server Software	MS Window Server Operating System – Current Ed,	Microsoft	
Badge Printer	By Owner.		
Reader Controller	Intelligent Reader controller	Mercury	Sy-EP1502
Reader Controller	Cloud Link for non-proprietary control	Synergis	Sy-CloudLink
Reader Interface	Reader Interface Module	HID	Sy-70100AEPON
Input/Output Board	16 input monitor interface module	Synergis	Sy-70200AEPON
Input/Output Board	12 output control interface module	Synergis	Sy-70300AEPON
Electronic Locks	Network hardwired electronic locks.		See door hardware
Electronic Locks	Network hardwired electronic exit trim compatibility locks.		See door hardware
Readers	Multi Technology Readers	HID	RPK40
Power Supply		Altronix	AL600
Cable	18 AWG 4 Conductor Bare Copper, Shielded Plenum	Belden or equal	
Cable	18 AWG 2 Conductor Bare Copper, Shielded Plenum		
Cable	22 AWG 2 Pair Bare Copper, Shielded Plenum		

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site conditions to determine site conditions are acceptable without qualifications. Notify Owner in writing if deficiencies are found. Starting work is evidence that site conditions are acceptable.

3.2 INSTALLATION

- A. Security Management System, including but not limited to access control, alarm monitoring, CCTV, and ID badging system shall be installed in accordance with the manufacturer's installation instructions.
- B. Supervise installation to appraise ongoing progress of other trades and contracts, make allowances for all ongoing work, and coordinate the requirements of the installation of the Security Management System.

3.3 FIELD TESTING AND CERTIFICATION

- A. Testing: The access control, alarm monitoring, CCTV, and ID badging system shall be tested in accordance with the following:
 1. Conduct a complete inspection and test of all installed access control and security monitoring equipment. This includes testing and verifying connection to equipment of other divisions such as life safety and elevators.
 2. Provide staff to test all devices and all operational features of the Security Management System for witness by the Owner's representative and authorities having jurisdiction as applicable.
 3. Correct deficiencies until satisfactory results are obtained.
 4. Submit written copies of test results.

END OF SECTION 28 13 00

SECTION 28 31 11 - FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Addressable, supervised fire alarm and smoke detection system. System shall be a voice evacuation type system.

1.2 RELATED SECTIONS

- A. Section 26 0500: ELECTRICAL REQUIREMENTS
- B. NFPA-2001 – Standard on Clean Agent Fire Extinguishing Systems, 2012
- C. Refer to Specification Sections 21 2200 and 21 1316

1.3 REFERENCES.

- A. NFPA 70 - National Electrical Code - 2014.
- B. NFPA 72 - National Fire Alarm Code - 2013.
- C. 6th Edition of the Florida Fire Prevention Code (2017) including NFPA 101 – Life Safety Code – Florida Specific Edition.
- D. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems
- E. 6th Edition of the Florida Building Code – 2017.
- F. Americans with Disabilities Act (ADA)

1.4 REGULATORY REQUIREMENTS AND APPROVALS

The system must have proper listing and/or approval from the following agencies:

- A. State Fire Marshall: State of Florida Uniform Fire Safety Rules and Standards.
- B. Underwriters Laboratories Inc. (UL):
 - 1. No. 50 Cabinets and Boxes, current edition
 - 2. No. 268 Smoke Detectors for Fire Protective Signaling Systems, current edition
 - 3. No. 864 Control Units for Fire Protective Signaling Systems, current edition
 - 4. No. 464 Audible Signaling Appliances.
 - 5. No. 38 Manually Actuated Signaling Boxes.
 - 6. No. 1481 Power supplies for Fire Protective Signaling Systems.
 - 7. No. 1971 Visual Indicating Appliances.
- C. Modular Labeling: The Fire Alarm Control Panel shall meet the Modular Listing requirements of Underwriters Laboratories Inc. To facilitate system changes and expansions, and to ensure that all subassemblies have the proper listing, each subassembly of the FACP shall carry the appropriate UL modular label. This includes all printed circuit board assemblies, power supplies, and enclosure parts. Systems which do not include modular labeling may require return to the factory for modifications, and are not acceptable.

1.5 DESCRIPTION OF SYSTEM

- A. The system shall be both an addressable and supervised, microprocessor based fire alarm control system with transient protection on each circuit and walk-through test capability. Each component of the system shall be UL listed for its use. The system shall have a Dynamic LCD display and be connected to the a remote monitoring station for emergency notification. The system shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, printer, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

1.6 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance with the specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Style 6 (Class A) signaling line circuit.
 - 2. Initiation device circuits shall be wired Class B (NFPA Style B).
 - 3. Indicating appliance circuits shall be wired Style Y (Class B).
 - 4. Digitized electronic signals shall employ check digits or multiple polling.
 - 5. A single ground or open on any system signaling line circuit, initiating device circuit, or indicating appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
 - 7. All point devices shall be tamper resistant and the control panel shall report trouble by plain language address for any device which is tampered with.
 - 8. System shall be installed in strict compliance with current ADA regulations.

C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

- 1. The System Alarm LED shall flash.
- 2. A local piezo-electric signal in the control panel shall sound. The system trouble signal shall be distinctly separate from the system alarm signal.
- 3. The 80-character LCD display shall indicate all information associated with the Fire Alarm condition, including the type of alarm point and its location within the protected premises. This information shall be displayed in “plain language” which is acceptable to the Owner and shall not be coded.
- 4. History storage equipment shall log the information associated each new Fire Alarm Control Panel condition, along with time and date of occurrence, for dial-up down load capability for remote print out of history.
- 5. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated System Outputs (alarm indicating appliances and/or relays) shall be activated. Specifically, if any device in a individual building is in alarm, the system shall activate all alarm indicating appliances in that respective building from which the alarm was initiated.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience.
- B. Installer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience and certified by the Florida State Licensing Board as fire alarm installing contractor.
- C. The Contractor shall maintain a service department capable of responding within 24 hours for maintenance and minor services, and four hours for major outages.
- D. A supervisor shall be assigned to the project and shall have a minimum 3 years experience installing fire alarm systems and be on site while fire alarm work is being performed.
- E. The fire alarm contractor shall be certified by the State of Florida with a current alarm contractor 1 license. The installation shall be supervised by an employee of the contractor who is qualified and has one of the following certifications: Alarm Contractor License 1; or an American Society of Industrial Security (ASIS) Certification. Copies of certifications for both the Company and the supervising installer shall be submitted with the project submittals and shall be approved prior to the commencement of work.

1.8 SUBMITTALS

- A. Submit six (6) copies shop drawings and product data, including detailed cut sheets on all equipment and devices, including control panel, batteries, power supplies, and all system devices. Shop drawings shall be submitted to the building department and fire marshal as required by the building department and fire marshal.
- B. Provide complete point to point wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes. Wiring diagrams shall indicate wire sizes and types. Submit cut sheets on wire types.
- C. Submit manufacturer's installation instructions.
- D. Submit manufacturer's certificate that the system meets or exceeds specified requirements - certification per NFPA 72.
- E. Submit copy of Contractor's license before work begins.
- F. Submit battery calculations, indicating a 30% spare capacity. Battery calculations shall be submitted with shop drawings with point to point wiring indicated.
- G. Submit voltage drop calculations for indicating appliance circuits if required by the local fire marshal.
- H. Submit power supply and indicating circuit appliance load calculations, including the separate strobe circuit.
- I. Submit amplifier load calculations using a 1 watt setting per speaker. This shall provide for spare capacity the amplifiers and allow for field adjustments.
- J. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.9 PROJECT RECORD DRAWINGS

- A. Contractor shall provide five (5) sets of As-built drawings produced on AutoCAD and all .DWG and .BAK files on CD to the Owner upon completion of project.
- B. As-builts shall include the location of end-of-line devices and exact conduit and wire routing. Numbers and types or conductors shall be indicated for each circuit.
- C. Provide all point addresses and device descriptions on the record drawings.

1.10 OPERATION AND MAINTENANCE DATA

- A. Provide two (2) copies of operation and maintenance data prior to beginning construction for all point devices, CPUs, and all other equipment. Manuals shall be in 3" three ring binders with plastic pocket holders and red in color.
- B. Include operating instructions, and maintenance and repair procedures. Provide all proprietary information and a copy of installation instructions for each device in each set of manuals.
- C. Provide manufacturer representative's letter stating that system is operational.
- D. Provide as-built drawings complete with point numbers, junction box locations conduit and circuit routing.
- E. Spec sheets on each system component, including operational data.
- F. Name, phone number and address of the installing fire alarm contractor, as well as the nearest factory authorized representative.
- G. System operating instructions and procedures sufficient to instruct owner's representative in operation of the system.
- H. All system certifications, warranty statements and other agreements.
- I. Any other information pertinent to the maintenance and repair of the system.

1.12 SOFTWARE

- A. The manufacturer, or authorized distributor, must maintain software version records on the system installed. The system software shall be upgraded free of any charge if a new version is released during the warranty period. For new version to correct operating problems, free upgrade shall apply during the entire life of the system. Provide updated read only software to District Maintenance Management with operation and maintenance manuals. Provide a copy of the updated program inside the FACP on site.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be delivered to job site in manufacturers original shipping packages.
- B. Provide storage and protection of products, as needed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Notifier NFS2 Series
- B. Edwards Systems Technologies – EST-3
- C. All systems shall be provided complete with voice command station(s) and associated annunciator.
- D. Specification and model numbers, where given, reflect Notifier devices. Equal devices shall be provided by alternative approved manufacturers.

NOTE : Approval of manufacturer's equipment does not in any way relieve the Contractor from meeting the performance criteria as outlined in the Plans and Specifications

2.2 MAIN FIRE ALARM CONTROL PANEL:

- A. The main FACP Central Console shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with, supervise and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system controlled devices.

The fire alarm system shall be capable of utilizing node-to-node, direct fiber connected multi-priority peer-to-peer network operations. All network wiring shall be fiber optic cable. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, annunciators, and workstations. Each node is an equal, active functional node of the network, which is capable of stand-alone decision making and generating network tasks to other nodes in the even of a node failure or fiber communications failure between nodes. The network fiber shall be connected in a Class A configuration, a single break on the network fiber isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined data bases. Should multiple fiber connections fail, the network shall re-configure into many sub-networks and continue to respond to alarm events from every panel that can transmit and receive network messages. Fire alarm fiber optic cabling shall be dedicated to the fire alarm system and be independent from the plant data network.

NOTE: This project only consist of one fire alarm control panel. Future panels will be connected via fiber so this initial main panel shall have the ability to expand to future panels and be connected over fiber optic cable.

The main FACP shall perform the following functions:

1. Supervise and monitor all intelligent/addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to monitor and control modules.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
4. Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.

5. The FACP shall be UL listed for compatibility with a security system.
6. Provide a graphic display at the FACP which indicates each device location and address. This can be a copy of the as-drawings folded and attached to the FACP.
7. System shall be a complete voice evacuation type system, capable of live and pre-recorded messages.
8. Audio Annunciation and Control
 - a. Provide a master one-way emergency audio control unit as part of the main alarm control panel. The emergency audio control shall contain a paging microphone and shall be capable of generating and delivering multi-channel audio messages simultaneously over copper and/or fiber media to remote parts of the facility. The control unit shall be located in the main reception office area.
 - b. All audio messages and live pages shall originate at the one-way audio control unit. The one-way audio control unit shall store up to 32 minutes of pre-recorded audio messages digitally as WAV files. These messages shall be automatically directed to various areas in a facility under program control. The unit shall have the capacity to store up to 200 individual audio messages and to simultaneously play back seven (7) different messages in addition to live page message.
 - c. During non-alarm conditions, the control unit shall continuously distribute a default audio message to all amplifiers, providing total audio path supervision. To enhance system survivability, each remote FACP cabinet containing an amplifier shall play the default audio message in the event of a fire AND a control network system failure.
 - d. The one-way emergency audio control shall provide control switches to direct live paging messages as follows:
 - aa. "All Call" to direct the page messages to all areas in the facility, overriding all other messages and tones.
 - bb. "Page to Evacuation Area" to direct the message to the evacuation area(s), overriding all other messages and tones.
 - cc. "Page to Alert Area" to direct page messages to the area(s) receiving the alert message and tones, overriding all other messages and tones.
 - dd. "Page to Balance Building" to direct page messages to the areas) in the facility NOT receiving either the evacuation area or alert area messages.
 - e. The system shall automatically deliver a preannounce tone of 1000 Hz for three seconds when the emergency operator presses the microphone PTT key. A 'ready to page' LED shall flash during the preannounce phase, and turn steady when the system is ready for the user's page delivery. The system shall include a page deactivation timer which activates for 3 seconds when the emergency user release the microphone talk key. Should the user subsequently press the microphone key during the deactivation period a page can be delivered immediately. Should the timer complete its cycle the system shall automatically restore emergency signaling and any subsequent paging will be preceded by the pre-announce tone. A VU display shall indicate voice level to the emergency operator.
 - f. The one-way audio control unit shall be capable of supporting up to 64 remote microphone inputs and a line level audio input.
 - g. The fire alarm control panels shall support remote cabinets with zoned amplifiers to receive, amplify and distribute messages through speakers over supervised circuits.
 - h. The master one-way emergency audio control unit shall be by Notifier/Honeywell, DVC Series.
 - i. Voice communications shall incorporate one way communications and tone generating, with true digital integrated audio into the peer-to-peer fiber network, multiplexing 8 independent audio channels. The system shall include distributed audio amplifiers, minimum one for each speaker circuit, for system survivability. The channels if simultaneous audio for fire alarm activation shall be programmed as follows:

Channel 1:	Mass Notification Message (highest priority)
Channel 2:	Fire Alarm Message
Channel 3:	Alert Message
Channel 4:	Stand-by Message

Channel 5:	Weather Message
Channel 6:	Spare (future use)
Channel 7:	Telephone Input Paging
Channel 8:	Manual Paging

B. System Capacity and General Operation

1. The control panel shall provide, or be capable of expansion to 198 intelligent/addressable devices per loop plus 2048 annunciation points per system.
2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the Field Programming and Control of the Fire Alarm System.
3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
4. The FACP shall be able to provide the following features:
 - a. Block Acknowledge. Charger Rate Control.
 - b. Control-By-Time. Day/Night Sensitivity.
 - c. Device Blink Control. Drift Compensation.
 - d. NFPA 72 Sensitivity Test. System Status Reports.
 - e. Alarm Verification. Printer Interface. Include printer either integral with the panel or stand alone. Provide printer stand and two boxes of printer paper. S-232 serial port.
 - f. CRT Display Interface. Non-Alarm Module Reporting.
 - g. Periodic Detector Test. Trouble Reminder.
 - h. Upload/Download to PC Computer.
 - i. Verification Counters. Walk Test.
 - j. Maintenance Alert. Security Monitor Points.

C. Central Processing Unit

1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the System Display by the Central Processing Unit.
2. The Central Processing Unit shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The Central Processing Unit shall also provide a real-time clock for time annotation of all system displays. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail.

D. Display

1. The System Display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The Display Assembly shall contain, and display as required, custom alphanumeric labels for all Intelligent Detectors, Addressable Modules, and Software zones. Include point address display for each.
3. The System Display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, DISPLAY TROUBLE, and SIGNAL SILENCE.
4. The System Display shall provide a 25-key touch key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels will be accessible through the Display Interface Assembly to prevent unauthorized system control or programming.
5. The System Display shall include the following operator control switches: SIGNAL SILENCE, LAMP TEST, RESET, SYSTEM TEST, and ACKNOWLEDGE.

- E. Loop Interface Board
 - 1. Loop Interface Boards shall be provided to monitor and control each of the Signaling Line Circuit (SLC) Loops in the system. The Loop Interface Board shall contain its own microprocessor, and shall be capable of operating in Local Mode in the case of a failure in the Main CPU of the Control Panel.
 - 2. The Loop Interface Board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations.
 - 3. The Loop Interface Board shall provide power to, and communicate with, all of the Intelligent/Addressable Detectors and Addressable Modules connected to its SLC Loop over a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4, Style 6, or Style 7. Provide a minimum of 2 SLC interface circuits.
 - 4. The Loop Interface Board shall be able to drive 2 Style 4 runs of these SLC Loops, each up to 10,000 feet in length, for an effective Loop span of 20,000 feet.
 - 5. The Loop Interface Board shall receive analog information from all Intelligent Detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular detector. The Loop Interface Board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
 - 6. The Loop Interface Board shall communicate with up to 198 Intelligent/Addressable Detectors and Addressable Modules on its SLC loop and verify proper device function and status.
- F. Serial Interface Board
 - 1. The Serial Interface Board shall provide the EIA-232 interfaces between the Fire Alarm Control Panel and the UL Listed Electronic Data Processing (EDP) peripherals.
 - 2. The Serial Interface Board shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports.
 - 3. The Serial Interface Board shall provide one EIA-485 port for the serial connection of the optional Annunciator and Control Subsystem components.
 - 4. The Serial Interface Board shall have LEDs that will show that it is in regular communication with the Annunciators or other EIA485 connected peripheral device.
 - 5. All EIA-232 serial output circuits shall be optically isolated.
- G. Enclosures:
 - 1. The control panels shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The control panel shall have a sheet of lexan mechanically fastened to the front of the entire panel such that all functions are still accessible.
 - 2. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top.
 - 3. All fire alarm equipment locks shall be keyed alike.
 - 3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).
 - 4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.
- H. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable. An external programmer may be used for the initial set-up but shall not be required for programming changes.
- I. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.
- J. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The

transmission scheme used should employ dual transmission or other equivalent error checking techniques.

K. Power Supply:

1. The Main Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP. Circuit shall be a dedicated circuit.
2. It shall provide a minimum of 3.0 amps of usable indicating appliance power, using a switching 24 VDC regulator. The power supply shall be sufficient to supply the required power for a minimum the entire building in alarm simultaneously, plus simultaneously provide continuous monitoring, supervision and annunciation of the remainder of the building.
3. It shall be expandable for additional indicating appliance power in 3.0 ampere steps. Provide one spare 3 ampere step in the current installation for future use. Also provide 2 extra circuits in each NAC panel in the system.
4. It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge.
5. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.
6. It shall be power-limited using Positive Temperature Coefficient (PTC) resistors.
7. It shall provide meters to indicate battery voltage and charging current.
8. Provide all required power supplies at each fire alarm terminal cabinet at each building. Power supplies shall be installed in a separate lockable cabinet.

L. System Circuit Supervision:

1. The FACP shall supervise all circuits to intelligent devices, annunciators and conventional peripherals and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate that device or devices are not responding and print the information on the printer.
2. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.

M. Field Wiring Terminal Blocks

1. For ease of service all wiring terminal blocks shall be the plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks that are not permanently fixed or mounted are not acceptable. Mount terminal blocks inside the fire alarm terminal cabinets. Wire nuts are not acceptable.

N. Operators Terminal: Provide the following functions in addition to any other functions required for the system.

1. Acknowledge (ACK/STEP) Switch:
 - a. Activation of the control panel Acknowledge switch in response to a single new Alarm and/or Trouble condition shall silence the local panel piezo electric signal and change the System Alarm or Trouble LED from flashing mode to steady-ON mode. If additional new Alarm or Trouble conditions exist or are detected and reported in the system, depression of this switch shall advance the 80-character LCD display to the next Alarm or Trouble condition.
 - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Signal Silence Switch.
 - a. Activation of the Signal Silence Switch shall cause all programmed Alarm Indicating Appliances and relays to return to the normal condition after an alarm condition. The selection of indicating circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. No delay in the activation.
3. System Reset Switch.
 - a. Activation of the System Reset Switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

- b. If the alarm condition(s) still exist, or if they reoccur in the system after System Reset Switch activation, the system shall abort the reset and indicate as to this affect on the LCD display.
 4. System Test Switch.
 - a. Activation of the System Test Switch shall initiate an automatic test of all Intelligent/Addressable detectors in the system. The System Test shall activate the electronics in each intelligent sensor, simulating an alarm condition and causing the transmission of the alarm condition from that sensor to the Fire Alarm Control Panel. The Fire Alarm Control Panel shall interpret the data from each sensor installed in the system. A report summarizing the results of this test shall be displayed automatically on the System Liquid Crystal Display, as well as on any CRTs or printers in the System.
 5. Lamp Test Switch.
 - a. Activation of the Lamp Test Switch shall sequentially turn on all LED indicators, System Liquid Crystal Display and Local Piezo-Electric signal, and then automatically return the Fire Alarm Control Panel to the previous condition.
- O. Dial-Up Connection
1. Provide RS232 port for dial up connection to down load event history. Provide Procom Plus 4.8, CD, Windows, by Symantec, #14-00-00397 or latest up-date and all programing required for start-up.
- P. System Expansion: Design the main FACP and transponders so that the system can be expanded in the future (to include the addition of thirty (30%) percent more circuits or zones) without disruption or replacement of the existing control panel. This shall include hardware capacity, software capacity and cabinet space. NAC panels shall have two spare circuits available for future use.
- Q. It shall be the responsibility of the equipment supplier /installer to ensure that all equipment supplied will fit in locations designated on plans and in the specifications. As-built drawings shall indicate all locations of control modules and conduit routing.
- R. Specific System Operations
1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the System keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
 2. Alarm Verification: Each of the Intelligent/Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification Function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system, or anytime after system turn-on. The Alarm Verification shall not require any additional hardware to be added to the Fire Alarm Control Panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
 3. System Point Operations
 - a. Any Device in the system may be Enabled or Disabled through the system keypad or video terminal.
 - b. Any system output point may be turned on, or off, from the system keypad or the video terminal.
 4. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point will be annunciated for the parameters listed:
 - a. Device Status.
 - b. Device Type.
 - c. Custom Device Label.
 - d. Software Zone Label.
 - e. Device Zone Assignments.
 - f. Analog Detector Sensitivity.
 - g. All Program Parameters.

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status:
 6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 400 system output/input/control activations. Each of these activations will be stored and time and date stamped with the actual time of the activation, until an operator requests that the contents be either displayed or printed. The contents of the History Buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed. The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
 7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each Intelligent System Detector and shall analyze the detector responses over a period of time. If any Intelligent Detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular Intelligent Detector will be annunciated on the System Display, and printed on the System Printer. This feature shall in no way inhibit the receipt of Alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
- T. All addressable devices, including detectors, bases, and control modules shall be labeled with the applicable station code, and/or point (SLC) address. All devices shall be labeled as to NAC panel and corresponding circuit.
- U. Audio Amplifiers
1. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels as directed by system programming.
 2. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall provide a selectable 25/70 Vrms output, suitable for connection to emergency speakers.
 3. To enhance system survivability in the event of a total loss of audio data communications, all amplifiers shall default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC message on their speaker circuits. In the event of a loss of the fully digitized, multiplexed audio riser data, the audio amplifiers shall automatically default to an internally generated alarm tone which shall sound a 3-3-3 temporal pattern.
 4. Amplifiers shall also include a 24 VDC notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable.
 5. Provide as minimum, one twenty (20) watt audio amplifier per speaker circuit. Initial amplifier loading shall not exceed 80% in order to allow for future system expansion. Calculations shall assume each speaker is connected at one (1) watt.
 6. Audio amplifiers shall be Notifier devices.

2.3 SYSTEM COMPONENTS:

- A. Manual Pull Station: Semi-flush mounted, supervised, normally open single action, addressable type manual pull station. Manual stations shall be single action and shall be constructed of impact resistant lexan with raised white lettering and a smooth high gloss finish. The station shall have a hinged front with key lock. Stations which utilize screwdrivers, Allen wrenches, or other commonly available tools shall not be accepted. Stations shall be keyed alike with the fire alarm control panel. When the station is operated, the handle shall lock in a protruding manner to facilitate quick visual identification of the activated station
- B. Speakers and Strobes:
1. Speaker-Strobe-Wall
 - a. Provide low profile wall mounted strobe-strobes at the locations shown on the drawings.
 - b. The low profile strobe-strobes shall mount in a North American 4" x 2 1/8" square electrical box, without trims or extension rings, and protrude less than 1" from the finished wall. Exterior devices shall be installed in a weatherproof, watertight box.
 - c. The strobe output shall be switch selectable from the following available settings: 2W (90dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (81dBA) at 10 ft. when measured in

reverberation room per UL-464. Frequency response shall be 400 to 4,000Hz. The selected strobe wattage shall be visible when the strobe-strobe is in its installed position.

- d. The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the strobe-strobe is in its installed position. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.
 - e. When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules
 - f. Strobe and strobe power, strobe silencing, and strobe synchronization shall be accomplished over a single pair of wires. Both the strobe and strobe elements shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - g. Exterior devices shall be weatherproof, waterproof type.
 - h. The low profile wall mounted strobe-strobes shall be Notifier.
3. Strobe-Strobe-Ceiling
- a. Provide low profile ceiling mounted strobe-strobes at the locations shown on the drawings.
 - b. Strobe-strobes shall mount in a North American 4" x 2 1/8" square electrical box, or a 960A-4RF round flush box, and protrude less than 1.6" from the finished ceiling.
 - c. The strobe output shall be switch selectable from the following available settings: 2W (91dBA), 1W (87dBA), 1/2W (84dBA), or 1/4W (80dBA) at 10 ft. when measured in reverberation room per UL-1480. Frequency response shall be 400 to 4,000Hz. The selected strobe wattage shall be visible when the strobe-strobe is in its installed position.
 - d. The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 95cd or 95cd, 115cd, 150cd, & 177cd. Selected strobe rating shall be visible when the strobe-strobe is in its installed position.
 - e. When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules
 - f. Strobe power and synchronization shall be accomplished over a single pair of wires. Both the strobe and strobe elements shall provide in and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - g. The low profile ceiling mounted strobe-strobes shall be Notifier.

C. Strobe Lights:

1. Visual Flashing Lamps (Xenon Strobe): Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state and field adjustable. These devices shall be UL listed for use as a fire alarm indicating appliance and be capable of either ceiling or wall mounting. The lexan lens shall be pyramidal in shape to allow better visibility.
2. Shall operate on 24 VDC nominal.
3. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria:
 - a. The maximum pulse duration shall be 2/10ths of one second.
 - b. Unless otherwise specified on the drawings or required for ADA compliance, the intensity shall be a minimum of 75 candela.
 - c. The flash rate shall be a minimum of 1 Hz and a maximum of 3 Hz.
 - d. Strobes shall be synchronized wherever required by NFPA-72.
4. Must be UL listed for system or current design with ADA required flash rate and intensity. Must be field adjustable.

D. Audible/Visual Combination Devices:

1. Audio/Visual Alarm Indicating Appliance: Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The housing shall be designed to accommodate either strobes, bells, chimes, or strobes. The unit shall be complete with a tamper

resistant, pyramidal shaped lexan lens with "Fire" lettering visible from a 180 degree field of view. The front panel or bezel which is constructed of cast metal or LEXAN maybe inverted so that the lens is below the audible device. The lamp assembly shall incorporate a built-in reflector for more efficient light propagation and a special shock-mounting arrangement to resist lamp failure due o vibration. Unit shall be complete with all mounting hardware including backbox. Audio/Visual unit shall be UL Listed as a fire alarm indicating appliance.

2. Shall meet the applicable requirements of Section B listed above for audibility.
3. Shall meet the requirements of Section C listed above for visibility.
4. Notifier with the ADA required flash rate and intensity.

E. Intelligent Photoelectric Smoke Detectors

1. Smoke detectors shall be intelligent and addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuit loops. Up to 250 intelligent detectors may connect to one SLC loop.
2. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
3. The detectors shall be ceiling-mount and shall include a twist-lock base. Detectors shall be capable of mounting in an audible base when provided.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head using decimal switches. Because of the possibility of installation error, systems that use binary jumpers on dip-switches to set the detector address are not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector.
6. The detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be controlled through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.
7. The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
8. Using software in the FACP, the detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
9. Detectors shall be listed to U.L. Standard 268 and shall be documented compatible with the control equipment to which it is connected. Detectors shall be listed for this purpose by Underwriters Laboratories, Inc. The detectors shall obtain their operating power from the fire alarm panel supervised detection loop. The operating voltage shall be 24 VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel.
10. To minimize nuisance alarms, voltage and RF transient suppression techniques shall be employed as-well-as an insect screen. The detector head shall be easily disassembled to facilitate cleaning.
11. Detector and associated base shall be labeled with the applicable matching station code.
12. Notifier #FSP-851 or equal.

F. Duct Mounted Smoke Detectors: Duct mounted smoke detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle. The detectors shall be the same as the smoke detectors described in Section 2.04, E., above. Detectors shall be 4 wire operation, addressable type for use on an addressable type system. The detectors shall be mounted in a duct housing with an integral red LED which shall pulse continuously to indicate power on and glow continuously to indicate alarm or sensor trouble condition. The detectors shall be designed to

ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive materials shall be used. Provide supervised automatic fan shutdown via the control panel.

1. Provide a remote alarm indicator with a test switch for duct mounted smoke detector. Provide a sampling tube sized for the required duct width and rated for the air velocity present in the duct.
- G. Monitor Module (Individual Addressable Module)
1. Addressable Monitor modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any N.O. dry contact device), such as tamper switches and water flow switches, to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.
 2. The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box. Label the box with an address point and box to be painted red.
 3. The IDC zone may be wired for Style D or Style B operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dip-switches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.
 4. All Monitor Modules shall be located in an accessible area without the need for a ladder.
- H. Control Module
1. Addressable Control Modules shall be provided to supervise and control the operation of one conventional Indicating Appliance Circuit (IAC) of compatible, 24 VDC powered, polarized Audio/Visual Indicating Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
 2. The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox, or adjacent to the Fire Alarm Control Panel.
 3. The IAC may be wired for Style Z or Style Y IAC (Up to 1 Amp of Inductive A/V Signal, or 2 Amps of Resistive A/V Signal) operation, or as a Dry Contact (Form C) Relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or IACs may be energized at the same time on the same pair of wires.
 4. Audio/Visual Power shall be provided by a separate supervised Power Loop from the main Fire Alarm Control Panel or from a supervised, UL listed Remote Power Supply, as required. All NAC panels shall be mounted at 5" to the top of the panel. NAC panels are to be located in IDF rooms or electrical rooms. Mechanical rooms are acceptable only at listed heights.
 5. The Control Module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Control Panel shall use to identify the type of device. Modules that use binary jumpers or dip-switches are subject to installation errors and are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the Control Panel.
 6. A magnetic test switch shall be provided to test the module without opening or shorting its IAC wiring.
 7. Notifier #CMX-1 or equal.
- I. Isolator Module
1. Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
 2. If a wire-to-wire short occurs, the Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section of the SLC loop.
 3. The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
 4. The Isolator Module shall mount in a standard 4-inch deep electrical box, in a surface mounted backbox, or in the Fire Alarm Control Panel. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

5. Notifier #ISO-X or equal.

2.4 BATTERIES AND CHARGER:

A. Batteries:

1. Shall be 12 volt, Gell-Cell type. Provide additional batteries and batteries for all new power supplies, as required.
2. Batteries shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm, plus 30% spare additional capacity.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.
4. Provide battery calculations clearly indicating the required 30% spare capacity. Calculations shall be submitted for approval.
5. Provide separate battery cabinets where necessary.

2.5 LIGHTNING PROTECTION

- A. Provide surge suppression on all initiation device circuits (SLC loops) and all indicating appliance circuits. Surge suppression shall be UL listed and Fire marshal approved for use with the specific fire alarm system and control panel. Surge devices shall be installed in a separate cabinet with separate terminal boards from the control panel. Clamping voltage shall be 43 volts. EDCO #PC-642C for signal circuit and EDCO #P264 series for alarm circuits. EDCO only.
- B. Provide lightning and surge protection at all points entering and leaving the building and at the FACP location shown on the drawings.
- C. Provide 120 volt surge suppressor for the 120 volt power circuit to the FACP and all power expander panels. Leviton #51020WM or approved equal.

2.6 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

- A. Provide automatic digital monitoring and signaling capability for connection of the fire alarm control panel to a remote monitoring company. The DACT may be internal to the FACP or separate. Provide conduit and cabling from the fire alarm control panel to the DACT in order to transmit all trouble and alarm conditions. Provide the required two dedicated telephone lines from the main telephone backboard directly to the FACP for monitoring the DACT. Provide the required 120 volt power circuit. Coordinate connection and remote monitoring requirements with Owner's telecommunications personnel.
- B. IP and fire alarm communicator with built-in dialer shall be Honeywell Model #IPGSM-4G
- C. The communicator shall annunciate all alarms, trouble signals, and supervisory signals to the remote monitoring location as a point-to-point address with the description of the device and the location by building and room number.

2.7 CLEAN AGENT FIRE SUPPRESSION

- A. Provide all required control and monitoring interface with the clean agent fire suppression system. Refer to specification 21 2200 and provide all required power, fire alarm wiring, and fire alarm control. Provide control of any dampers as required to close and seal the room in alarm. Provide indication of all supervisory, trouble, and alarm signals from the clean agent panels.
- B. Monitor the clean agent panels for alarm, trouble, and supervisory. All smoke detection in the clean agent spaces shall be provided as a part of the clean agent system, per specification 21 2200, with the exception of the fire alarm system smoke detector above the clean agent panel. Provide the smoke detector above the clean agent control panel.

2.8 PRE-ACTION SPRINKLER SYSTEM

- A. Provide all required control and monitoring interface with the pre-action fire suppression system. Refer to specification 21 1316 and provide all required power, fire alarm wiring, and fire alarm control, including the following:
 1. Ceiling mounted heat detectors. These detectors shall be included as part of the pre-action control system and connected to the pre-action control panel.

2. Supervise the air compressor status.
3. Monitor the pre-action control panel(s) for alarm, trouble and supervisory signals.

2.9 ACCESS CONTROL SYSTEM DOOR RELEASE

- A. Provide all required control to release all means of egress doors for the access control for free egress upon the initiation of a fire alarm.

PART 3 - SEQUENCE OF OPERATION

3.1 ENTIRE BUILDING

- A. The system shall supervise all initiation devices and indicating appliances. Initiation devices shall, when placed in an alarm mode, sound all building general alarm, flash strobe lights, annunciate the address of the initiating device to the FACP, FAA, and notify the monitoring company through the DACT.
 1. Activate all programmed indicating circuits until silenced.
 2. Actuate all programmed strobe units until the panel is reset.
 3. Annunciate the active initiating devices.
- B. All initiation devices shall, when placed in a trouble mode, indicate the address of the device experiencing trouble to the FACP, FAA and to the monitoring company via the DACT.

PART 4 - PROGRAMMING

4.1 PROGRAMMING AND SOFTWARE MODIFICATIONS

- A. The system shall be fully programmed, set up and made operational prior to substantial completion. The Contractor shall include re-programming of the system up to three more times after substantial completion (for each phase of construction and each building) to make Owner requested revisions, Fire Marshal requested revisions or Engineer requested revisions to the program. The Contractor shall re-certify the system each time a program change is made and provide a new written certification.
- B. The FACP and CPU shall have the capability to be fully programmable by Owner's personnel. Provide a full copy of the system final program and settings on a CD in the p[roject close-out documents. Also provide another copy of the CD inside the FACP.
- C. The Manufacturer shall provide all the necessary documentation and training to allow the Owner's personnel to maintain, program and change software.
- D. The services of a factory trained and authorized technician shall be available to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
- E. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
- F. All programming or editing of the program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
- G. Field Programming
 1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
 2. All programming shall be accomplished through the standard FACP keyboard or through the Video Display Terminal.
 3. All field defined programs shall be stored in non-volatile memory.

4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

PART 5 - EXECUTION

5.1 INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
 1. Pay for all permits and fees.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed only in unfinished areas. Junction box covers shall be painted red. Conduit shall be spot painted red approximately every 4 feet. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage. All boxes, terminal and junction boxes shall be mounted in an accessible location without the use of a ladder.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECAs "Standard of Installation" and NFPA-72E.
- E. Wiring Systems and Materials:
 1. Wiring shall be in accordance with requirements of the National Electrical Code (e.g., NEC Article 760) and NFPA Regulation 72 and as recommended by the manufacturer of the fire alarm system. The fire alarm system, including components and wiring shall be completely installed and wiring shall be properly tagged and color coded. The Electrical Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions. Wire nuts are not acceptable.
 2. All fire alarm system wiring must be new. All underground cable shall be rated for wet locations. THHN and/or THWN are not acceptable.
 3. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 14 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 12 AWG (1.63 mm) for Indicating Appliance Circuits.
 4. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 5. Wiring used for the communication loop shall be twisted and shielded and installed in conduit. The system should permit use of IDC and IAC wiring in the same conduit with the communication loop.
 6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
 7. Color Code - The wire color for the addressible fire alarm cabling shall be consistent throughout the project. Submit proposed color coding prior to installation.
 8. All wiring to be installed in conduit with continuous ground.
 9. All junction box covers shall be painted red. All lengths of conduits shall be spot painted red approximately every 4 feet or more often if required by the Authority Having Jurisdiction.
 10. AHU shutdown relays and equipment control relays shall be mounted within three (3) feet of controlled device. AHU shutdown relays shall be wired on a separate, dedicated circuit.
 11. All boxes with internal devices, such as the CMX modules, shall be labeled as to the device inside, its station code and plain language address.

12. All exposed devices shall have Roberts tamper proof screws.
 13. The use of wire nuts for wire splices and/or terminations is not acceptable. All terminations shall be made on terminals on fire alarm devices or inside terminal cabinets.
- F. Provide conduit, wire and circuit breakers to connect fire alarm control panels (or new power expander panels) to a dedicated circuit. Connection to the fire alarm system shall be on a dedicated branch circuit, maximum 20 amperes. The circuit breaker shall be accessible to authorized personnel only and shall be marked FIRE ALARM CIRCUIT CONTROL. Provide a padlockable handle lock. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG, copper minimum. The Control Panel Cabinet shall be grounded securely via a separate equipment grounding conductor to the panelboard equipment ground bar. The system ground shall be tested and corrected as necessary to allow proper system operation. Breaker lock is acceptable and include this provision on all NAC panel circuits (120 volt).
 - J. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.
 - K. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
 - L. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
 - M. All wiring shall be installed in conduit. Conduit shall be 1/2 inch minimum. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit. Conduit shall be installed in accordance with The National Electrical Code (NEC), local and state requirements. Underground conduit shall be at a minimum of 24" below grade. Provide a brightly colored plastic tape buried 6 inches below grade, above the fire alarm conduits, for identification purposes in case of future digging. All cabling or wiring underground shall be wet location rated. THHN and/or THWN are not acceptable.
 - N. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
 - O. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 - P. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer. All conduits for FACP to enter separate cabinet adjacent to FACP.
 - Q. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose. Mounting shall be at 5 feet or less to top of boxes. Ceiling mount is not acceptable.
 - R. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
 - S. Pull stations to be labeled with its point address.
 - T. Sensors to be labeled with its point address.
 - U. Mounting and locating of Duct Detectors shall be to manufacturers specifications.
 - V. Strobe DB level to adhere to local code levels, but as a minimum shall meet NFPA requirements.
 - W. Provide approved clear covers on devices for areas prone to vandalism or other damage: Hallways, Common Bathrooms.

- X. FACP shall be located not in unsecured areas. Also surge suppression for FACP shall be mounted in approved separate cabinet located next to FACP.
- Y. Junction boxes to be readily accessible. If wall mounted do not mount less than 40" from finished floor. Ceiling mounting is not acceptable.
- Z. Free wire not acceptable. Entire system must be in conduit.
- AA. Installed system shall comply with all requirements of local authority.
- BB. The Fire Alarm system shall be UL listed as a Central Station Service.

5.2 QUALITY ASSURANCE

- A. NEC Compliance comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.
- B. UL Compliance and Labeling - Provide fire alarm and detection system components which are UL listed and labeled. Installation is to be by a UL listed installer.
- C. Misc. compliance - The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and comply with all applicable portions of the NECAs "Standard Installation" and all local codes and ordinances.

5.3 SYSTEM GUARANTEE, MAINTENANCE & TESTING

- A. All work performed and all material and equipment furnished under this contract shall be guaranteed against defects in materials and workmanship for a period of twelve (12) months commencing the date of acceptance by the Fire Marshall and the Owner. Warranty service shall be provided by a qualified factory trained representative of the equipment manufacturer. Service response time shall be a maximum of four (4) hours before arrival to site. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submitted bid. The warranty shall include parts, labor, prompt field service, pick-up, and delivery.
- B. These warranty services for the fire alarm system shall be provided from a factory trained authorized representative of the manufacturer of the major equipment.

5.4 TESTING AND FIELD QUALITY CONTROL

- A. The Manufacturer's representative shall perform a quality inspection of the final installation and, in the presence of the Engineer, Electrical Contractor, fire marshal and Owner's Representatives, shall perform a complete functional test of the system. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 2. Open initiating device circuits and verify that the trouble signal actuates.
 3. Open signaling line circuits and verify that the trouble signal actuates.
 4. Open and short indicating appliance circuits and verify that trouble signal actuates.
 5. Ground initiating device circuits and verify response of trouble signals.
 6. Ground signaling line circuits and verify response of trouble signals.
 7. Ground indicating appliance circuits and verify response of trouble signals.
 8. Check presence and audibility of tone at all alarm notification devices.
 9. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
 10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

12. To assure that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100% of devices being in alarm or operated simultaneously, this test shall include the following:
 - a. Place all sensors and monitor modules in alarm. Each shall display it's address and alarm condition. At least the first ten (10) devices on each circuit shall also have their alarm LEDs lighted.
 - b. Operate all control modules for the alarm or operated condition. Each module shall display it's address and condition.
 - c. Reset all alarmed and operated devices. The panel shall display the address or zone of any off-normal devices.
 - d. Test a representative number of sensors for alarm verification by momentarily testing for alarm. The sensor shall not initiate an alarm. Then, test by placing the sensor in alarm such that it remains in alarm for the selected verification time. The sensor shall initiate an alarm.
 - e. In addition, the Contractor shall also perform all electrical and mechanical tests required by the equipment manufacturer's testing standards and the National Fire Protection Association - 72. All test and report costs shall be included in the contract price.
 - f. Inspect relays and signals for malfunctioning, and where necessary adjust units for proper operation to fulfill project requirements. Any fine adjustment shall be performed by specially trained personnel in direct employ of manufacturer of the fire alarm detection system equipment.
- B. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.
- C. The Contractor shall supply personnel and required auxiliary equipment for testing without additional cost to the Owner.

5.5 DOCUMENTATION

- A. After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the the Owner.
 1. A copy of the test report described in this specification and a Certificate of Compliance prepared as per National Fire Protection Association Standard 72 and State Fire Marshal's Rule 4A-48 to be completed at final test.
 2. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one (1) copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:
 - a. A complete list of equipment installed and wired.
 - b. Indication that all equipment is properly installed and functions and conforms with these specifications.
 - c. Test result of individual initiating devices and indicating appliances.
 - d. Serial numbers, locations by address and model number for each installed detector.
 - e. Technician's name, certificate number and date.
 3. Affixed to FACP a standard service tag, as described in rule 4A-48 for fire alarm contractors by the Office of the State Fire Marshal.
 4. Before final acceptance of work; the Contractor shall deliver six (6) copies of a composite "Operating and Shop Maintenance Manual." Each manual shall contain, but not be limited to:
 - a. A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.
 - b. Individual factory issued manuals containing all technical information on each piece of equipment installed. In the event that such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.
 - c. Three (3) copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins.

5. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

B. Provide typewritten, short form operation instructions and locate them at the fire alarm control panel in a location as instructed by the Owner.

5.6 INSTRUCTION AND TRAINING:

A. Provide training for up to two separate training sessions on the operation, maintenance, and repair of the system at the Contractor's expense. Training shall be certified by the manufacturer and be at different times at the convenience of the Owner. Include transportation, room and board where required for the necessary training. The training session, for personnel selected by the Owner, shall be presented by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation. Videotaping of the training shall be an option of the Owner.

B. Provide a written description of standard control panel functions and user instructions at each FACP. These instructions shall be written in standard laymen's English so that an unfamiliar operator can accomplish basic functions such as reset.

C. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

D. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the Owner.

E. Provide a copy of the software program on site in CD format, taped or otherwise permanently stored inside the FACP.

END OF SECTION 28 31 11

SECTION 31 31 16 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Soil treatment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
 - 2. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of termite control product.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.
- D. Sample Warranties: For special warranties.

1.5 FIELD CONDITIONS

- A. Soil Treatment:
 - 1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
 - 2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (*Coptotermes formosanus*). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
 - 1. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
 - 1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
 - 3. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.

- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

- A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SECTION 31 31 16

SECTION 32 12 36 - ASPHALT SEAL COATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 Scope of Work

- A. The Work covered by these Specifications consists of providing all plant, labor, equipment supplies, material, transportation, handling, and storage, and performing all operations necessary to complete the construction of seal coat of asphalt cement.

1.3 Applicable Standards

- A. The latest revision of the following standards: American Society for Testing and Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), and State of Georgia Department of Transportation and Public Facilities, Methods and Standard Practices (ATM) are hereby made a part of these Specifications. ASTM C-29 Test for Unit Weight of Aggregate
- B. ASTM C-117 Test for Materials Finer than No. 200 Sieve in Mineral Aggregates ASTM C-127 Test for Specific Gravity and Absorption of Coarse Aggregate ASTM C-128 Test for Specific Gravity and Absorption of Fine Aggregate
- C. ASTM C-183 Sampling Hydraulic Cement
- D. ASTM D-75 Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
- E. ASTM D-140 Sampling Bituminous Materials
- F. ASTM D-242 Specification for Mineral Filler for Bituminous Paving Mixtures
- G. ASTM D-4125 Standard Test Method for Asphalt Content of Bituminous Mixtures by

1.4 Warranty

- A. Provide a one-year warranty on workmanship of all pavement seal coating applied.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Material shall conform to the following requirements:

	MIN	MAX	
1. Weight (per gallon)	9.0 lbs		A.S.T.M. D244
2. Cone Penetration	340 mm	700	A.S.T.M. D217
3. %Non-Volatile	50		*ASMA A-1
4. %Non-Volatile Soluble in Tri- Cloethylene	10	35	A.S.T.M. D2042
5. Wet Track Abrasion		35 gram loss	A.S.T.M. D3910
6. Mineral Aggregate Components	#16 Sieve 100% passing		A.S.T.M. C136
7. Dried Film Color Viscosity	Black 75 KREB		A.S.T.M. D562
8. Accelerated Weathering	No Deterioration		Fed Spec TT- C555B

*weigh 10 grams of homogenous product into a previously tared, small ointment can. Place in a constant temperature oven at 325 degrees F for 90 minutes. Cool, reweigh and calculate non-volatile components.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

- A. Surface Preparation: Purpose: The surface to receive asphalt sealcoat must be free of all foreign material and dry immediately prior to sealcoat application.
- B. Clean surface by air blowing, vacuum, mechanical sweeping, washing, or other techniques as approved by engineer / owner.
- C. Pretreatment and scrap any oil / grease spots to insure prior adhesion of seal coating. Cleaning of such areas can be scraping, burning and/or chemical cleaning. (Where chemical cleaning is to be the method of cleaning MSDA sheets on all chemicals must be submitted to the owner prior to use.)
- D. Remove any vegetation in cracks and treat the areas with a non-oil base soil sterilant prior to treating the crack as outlined in this document.
- E. Cracks in excess of ¼ inch, but less than 1 inch in width must be properly sealed, in a fashion consistent to the manufactures recommendations of the sealcoat product, prior to seal coat application. Crack filler shall be hot or cold applied product designed to be compatible with the seal coating and meet current MDOT standards.

3.2 APPLICATION

- A. Purpose: The sealer must be applied to sound pavements. It is not a method of resurfacing deteriorated pavement. The sealer is specifically formulated to shield against the drying action of the sun, resist damage from oil and gasoline leakage and prevent water penetration. The sealer can extend the life of the pavement IF applied to sound pavement on an as needed schedule. For optimal protection Rate (undiluted material) 2 coats at 30 gallons per 100 square feet (15 gallons each coat)
 - 1. First application of the seal coat must be dry prior to the second application of seal coat.
 - 2. Sealer should not be applied unless pavement temperature is at least 50 °F (10 °C) and the air temperature is 50 °F (10 °C) and rising.
 - 3. Sealer should not be applied during rainy or wet weather, or when rain is anticipated within eight hours after application is completed.
 - 4. Sealer should not be applied to hot surfaces under the summer sun (over 90 °F, ambient) without first cooling the surface with clean water. Water should dampen the surface without leaving puddles.
 - 5. Seal coat shall be applied uniformly, free of lumps and other inconsistencies, leaving no ridge or uncoated areas.
 - 6. Application method shall be by an approved method as recommended by the manufacture of the product being applied.

3.3 PROTECTION

- A. Barricade work areas during installation and for 24 hours after or the seal coat is dried and ready for traffic. (material manufactures recommendations shall be the guide)
- B. Insure that overspray is properly contained during the application process. This is to include, but not limited to, protection of adjacent properties, buildings, fences, vehicles, ect.
- C. All work shall be conducted and adhere to current OSHA and/or State of Florida rules and regulations

3.4 DEFECTIVE WORKMANSHIP OR MATERIAL

- A. When any material, not conforming to the requirements of this specification or drawings, has been delivered to the project or incorporated in the work, or any work performed is of inferior quality, such defective material or work shall be corrected as directed by the Owner, at the expense of the Installer.
- B. Pavement Marking / Striping
 - 1. All sealed areas shall be remarked / striped to as is prior to seal coating or current ADA and code as may apply.

END OF SECTION 32 12 36