

The Enclosed Document Is Provided For Your Convenience.

Please Email ALL Questions:
[MailTo:ContractAdministration@TampaGov.net](mailto:ContractAdministration@TampaGov.net)

Please Let Us Know If You Plan To Bid

City of Tampa
Contract Administration Department
306 E. Jackson St. #280A4N
Tampa, FL 33602
(813)274-8456

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 18-C-00040

New Tampa Recreation Center Addition

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

JANUARY 2019

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.: 18-C-00040; New Tampa Recreation Center Addition

BID OPENING: 1:30PM, Tuesday, February 12, 2019 **ESTIMATE:** \$1,700,000 **SCOPE:** The project comprises construction of a 7400 square foot addition to the existing recreation building including new multipurpose room, preschool gym, training room, restrooms and storage along with new chiller to support existing building and addition and related mechanical, electrical and plumbing (MEP) work along with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications in accordance with the Contract Documents. **PRE-BID CONFERENCE:** 10:00AM, Tuesday, January 29, 2019. 17302 Commerce Park Blvd Tampa, FL 33647 Attendance is not mandatory, but recommended.

Bids will be opened in the 4th Floor Conference Room, Tampa Municipal Office Building, 306 E. Jackson Street, Tampa, Florida 33602. Pre-Bid Conference is held at the same location unless otherwise indicated. Plans and Specifications and Addenda for this work may be examined at, and downloaded from, www.demandstar.com. Backup files are 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 18-C-00040; New Tampa Recreation Center Addition

Sealed Proposals will be received by the City of Tampa no later than 1:30 P.M., February 12, 2019, 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, construction of a 7400 square foot addition to the existing recreation building including new multipurpose room, preschool gym, training room, restrooms and storage along with new chiller to support existing building and addition and related mechanical, electrical and plumbing (MEP) work along with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications 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 New Tampa Recreation Center Addition 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 300 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): ___% 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*
 24 % 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 (GFECP) (MBD Form-50) for specific requirements.

GOOD FAITH EFFORT COMPLIANCE PLAN (GFECP) REQUIRED (MBD FORM-50). When a Goal has been established, the Bidder **must submit** with its bid a Good Faith Effort Compliance Plan (GFECP) 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 GFECP (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 GFECP 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.shtml>. 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 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.

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 (RPL) 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.

Index

- 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

New Tampa Recreation Center Addition

Project #18-C-00040

U-WMBE Availability Contact List

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

#	Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
1	ECO 2000 INC	352-793-5060	352-793-9074	WATERWORKS@ECO2000INC.COM	1611 W C-48	BUSHNELL	FL	33513	Site Work	593648996	BBE	African American
1	MBattle Construction llc	727-214-4301	727-517-3774	moebattle@hotmail.com	470 maple way	Safety harbor	FL	34695	Site Work	760840117	BBE	African American
1	McKenzie Contracting LLC	813-454-4429	813-454-4429	kathy@mckenziecontractingllc.com	7712 E. Broadway Ave	Tampa	FL	33619	Site Work	463561860	BBE	African American
2	Reggies Affordable Heating & Cooling	813-453-5752	941-737-7781	reggie@reggiesac.com	5614 E 29th Ave	Tampa	FL	33619	HVAC	205282459	BBE	African American
3	Reeves Building and Plumbing	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Plumbing	593011515	BBE	African American
4	All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATERS AVE	TAMPA	FL	33604	Electrical	043689273	BBE	African American
4	Brown & Brown Electric, Inc.	954-938-8986	954-938-9272	Hermine.Brown@brownandbrownelectric.com	1150 SW 30th Avenue	Pompano Beach	FL	33069	Electrical	592283934	BBE	African American
4	MDH Enterprises, Inc.	386-789-2672	866-681-5026	matize@my-es.com	281 East C Street	Orange City	FL	32763	Electrical	550849332	BBE	African American
5	Allen Masonry & General Contracting	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	2049 Waikiki Way	Tampa	FL	33619	Concrete and Steel	593752366	BBE	African American
5	Denson Construction Inc.	863-709-1001	863-709-1071	pete@denison-construction.com	4270 HOLDEN ROAD	LAKELAND	FL	33811	Concrete and Steel	593571944	BBE	African American
5	E/S Concrete Service, Inc.	727-821-5029	727-821-5029	enorisslysr@yahoo.com	726 E. Harbor Drive	St. Petersburg	FL	33705	Concrete and Steel	593119582	BBE	African American
5	Excel 4 LLC	813-433-3486	813-433-3486	excel4llc@yahoo.com	318 N. John Young Parkway	Kissimmee	FL	34741	Concrete and Steel	454149326	BBE	African American
5	Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Concrete and Steel	592345574	BBE	African American
5	Fresh Start Development, Inc.	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburg Rd	Tampa	FL	33619	Concrete and Steel	203857845	BBE	African American
5	Mason Global LLC	813-323-3648	813-323-3648	alan@masongloballlc.com	6133 Lanshire Dr	Tampa	FL	33634	Concrete and Steel	471844251	BBE	African American
5	Provisions Construction & Development	407-985-2442	407-985-2440	marrington@provisionscdi.com	3401 Lake Breeze Drive	Orlando	FL	32808	Concrete and Steel	462802435	BBE	African American
5	WC Boxes, Inc.	813-478-1102	813-864-4386	wcindustries2003@gmail.com	17620 Lake Key Drive	Odessa	FL	33556	Concrete and Steel	472682190	BBE	African American
6	E.M. Enterprises General Contracting	813-241-9000	813-241-9001	carolyn.bolduc@emegc.com	3615 E. Lake Ave.	Tampa	FL	33610	Pre-Engineered Metal Building	510462433	BBE	African American
7	Allen Masonry & General Contracting	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	2049 Waikiki Way	Tampa	FL	33619	Masonry	593752366	BBE	African American

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

New Tampa Recreation Center Addition

Project #18-C-00040

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
7	E/S Concrete Service, Inc.	727-821-5029	727-821-5029	enorisslysr@yahoo.com	726 E. Harbor Drive	St. Petersburg	FL	33705	Masonry	593119582	BBE	African American
7	Fresh Start Development, Inc.	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburg Rd	Tampa	FL	33619	Masonry	203857845	BBE	African American
7	LMCC Specialty Contractors	407-298-6936	407-290-1217	lynn@mimsconstruction.com	119 S. Pine hills Rd.	Orlando	FL	32811	Masonry	593442318	BBE	African American
7	Mason Global LLC	813-323-3648	813-323-3648	alan@masongloballlc.com	6133 Lanshire Dr	Tampa	FL	33634	Masonry	471844251	BBE	African American
7	Paragon Building Contractors,	813-935-1600	813-932-1108	aldavisparagon@gmail.com	1201 W WATERS AVE	TAMPA	FL	33604	Masonry	592464751	BBE	African American
7	Provisions Construction & Dev	407-985-2442	407-985-2440	marrington@provisionscdi.com	3401 Lake Breeze Drive	Orlando	FL	32808	Masonry	462802435	BBE	African American
7	WC Boxes, Inc.	813-478-1102	813-864-4386	wcindustries2003@gmail.com	17620 Lake Key Drive	Odessa	FL	33556	Masonry	472682190	BBE	African American
9	Pro-Fit Development, Inc.	813-514-8783	813-231-8866	Info@Pro-FitDevelopment.com	4007 N Taliaferro Ave	Tampa	FL	33603	Thermal & Roofing	432013650	MBE	African American
9	Reeves Building and Plumbing	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Thermal & Roofing	593011515	MBE	African American
#	Envision-CS, Inc	813-997-0330	813-464-7677	info@envision-cs.com	5000 Acline Drive East	Tampa	FL	33619	Flooring	264124511	MBE	African American
#	Faithful Cleaning Service to the	813-210-3616	813-980-2428	faithfulcleaningservice17@yahoo.com	9824 Morris Glen Way	Tampa	FL	33637	Flooring	113724609	MBE	African American
#	Versa-Tile & Marble, Inc.	850-259-4667		shaun.womack@versatilemi.com	1620 Sand Hollow Lane	Valrico	FL	33594	Flooring	841634057	MBE	African American
#	Fletcher Painting, Inc.	407-290-1188	407-290-9309	stacy@fletcherenterprise.com	4355 Fairmont Street	Orlando	FL	32808	Painting & Coating	593587717	MBE	African American
#	Obi Global, LLC	813-400-8562		obigloballlc@gmail.com	11507 Dr. MLK Blvd	Mango	FL	33550	Painting & Coating	471881723	MBE	African American

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

New Tampa Recreation Center Addition

Project #18-C-00040

SLBE Availability Contact List

Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
MBattle Construction llc	727-214-4301	727-517-3774	moebattle@hotmail.com	470 maple way	safety harbor	FL	34695	Site Work	760840117	SLBE	African American
McKenzie Contracting LLC	813-454-4429	813-454-4429	kathy@mckenziecontractingllc.com	7712 E. Broadw	Tampa	FL	33619	Site Work	463561860	SLBE	African American
Mom & Daughter's Team LLC	727-657-5576		momanddaughter@yahoo.com	4883 58th St N	Kenneth City	FL	33709	Site Work	814091364	SLBE	Hispanic American
Ortzak Construction Group, LLC	813-961-6023	813-961-6023	dcastro@ortzak.com	13014 N. Dale N	Tampa	FL	33618	Site Work	454837502	SLBE	Hispanic American
Paynes Environmental Services, LLC	813-677-6822	866-467-9029	paynestrees@cs.com	5617 Causeway	Tampa	FL	33619	Site Work	771037046	SLBE	Hispanic American
R J LONGBOAT & SONS CONSTRUCTION	727-322-6336	727-873-6922	Imp@phinazeeconsulting.com	13463 Stag Horn	Tampa	FL	33626	Site Work	593486726	SLBE	Native American
YD West Coast Home, Inc.	813-879-0077	813-879-5724	mgonzalez@ydwestcoasthome.com	20026 Date Palm	Tampa	FL	33647	Site Work	452357137	SLBE	Hispanic American
DJ's Commercial Air, LLC	813-451-2272	813-948-1224	jcdc1001@hotmail.com	16557 Hanna Rd	Lutz	FL	33549	HVAC	113810019	SLBE	Caucasian
FIRST PINOY INC	813-504-2666	813-949-3901	info@firstpinoyairsystem.com	8235 leo kidd av	Port richey	FL	34668	HVAC	261605092	SLBE	Asian American
GEORGE G SOLAR & CO., INC.	813-875-9148	813-879-2315	georgesolarcompany@gmail.com	4407 W SOUTH	TAMPA	FL	33614	HVAC	591314899	SLBE	Hispanic American
Just Koolin Air Conditioning and Heating	813-444-2594	813-325-2145	Justkoolinac.adm@gmail.com	4210 E 22nd Av	Tampa	FL	33605	HVAC	455494658	SLBE	African American
Rex Farlow Construction, Inc.	813-924-3337		rfarlowconstruction@yahoo.com	1224 Jerry Smith	Dover	FL	33527	HVAC	412104737	SLBE	Caucasian
Spectrum Mechanical, LLC	727-535-1202	727-255-5705	info@spectrum-mechanical.com	11701 Belcher Fl	Largo	FL	33773	HVAC	472813128	SLBE	Caucasian
The Holmes Agency	727-369-0881	727-522-1064	Lou@theholmesagency.com	721 11th street	St Petersburg	FL	33705	HVAC	020542783	SLBE	Hispanic American
Advanced Systems Engineering, Inc.	727-540-9396	727-540-9376	david@ase2000.com	13555 Automob	Clearwater	FL	33762	Plumbing	593617586	SLBE	Caucasian
Ciccarello & Son, Inc.	813-933-5512	813-933-5225	jiccarello@ciccarelloandson.com	7117 N. Armenia	Tampa	FL	33604	Plumbing	593492581	SLBE	Caucasian
Johnny Doan Management, Inc.	813-689-8179	813-689-8170	tommyseffner@aol.com	418 E. Old Hills	Seffner	FL	33584	Plumbing	061677200	SLBE	Caucasian

New Tampa Recreation Center Addition

Project #18-C-00040

SLBE Availability Contact List

Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
JVA Plumbing, Inc.	813-841-5874	813-254-0256	Jannet.varon@jvaconstruction.com	4013 W Jetton Ave	Tampa	FL	33629	Plumbing	273906735	SLBE	Hispanic American
Larson Plumbing, Inc.	813-242-0911	813-242-0048	chris@larsonplumbing.net	3205 E. 8th Ave	Tampa	FL	33605	Plumbing	93254656	SLBE	Caucasian
Llona Plumbing, Inc.	813-477-1870	813-262-8599	silvia@llonaplumbing.com	1523 W. Grace St	Tampa	FL	33607	Plumbing	62444131	SLBE	Hispanic American
McLain & McLain Enterprises	813-876-9046	813-873-9895	sandramclain01@yahoo.com	2403 East 4th A	Tampa	FL	33605	Plumbing	93261752	SLBE	Caucasian
Reeves Building and Plumbing Corp	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Plumbing	93011515	SLBE	African American
Above Electric LLC	727-726-5484	801-894-3084	aboveelec@gmail.com	13529 Prestige	Tampa	FL	33635	Electrical	53611228	SLBE	Hispanic American
Aguila Electrical Services, Inc.	813-515-6999	813-884-4092	sales@aguilaelectrical.com	5708 N 56TH St	Tampa	FL	33610	Electrical	200818128	SLBE	Hispanic American
All In One Electric Inc	813-849-6331	813-514-0473	rjones@aioelectric.com	1201 W WATER	TAMPA	FL	33604	Electrical	43689273	SLBE	African American
Crevello Electric, Inc.	813-986-6106	813-986-9633	crevelloelectric@gmail.com	3305 N. Stanley	Plant City	FL	33565	Electrical	93559003	SLBE	Caucasian
Dolphin Constructors LLC	813-925-9609	813-510-4946	matt@dolphinllc.com	13966 W Hillsboro	Tampa	FL	33635	Electrical	12193468	SLBE	Caucasian
Electric World Corp	813-785-5265	866-593-5921	Electricworldcorp@gmail.com	5708 N 56th St	Tampa	FL	33610	Electrical	31112415	SLBE	Hispanic American
ELECTRICAL HANDYMAN SERVICES	813-901-8185	813-884-5060	ehs915@aol.com	7046-B West Hill	Tampa	FL	33634	Electrical	72406369	SLBE	Hispanic American
Manatee Electric, Inc.	813-645-7000	813-654-7568	john@reliableelectricusa.com	845 Thompson	Lithia	FL	33547	Electrical	93454485	SLBE	Caucasian
Reliability Consulting Services, Inc.	813-298-2617	813-645-2272	bwoolbright@reliabilityconsulting.net	748 Kingston Ct	Apollo Beach	FL	33572	Electrical	201126584	SLBE	Caucasian
ROB MICHAEL INC	813-323-0304	813-968-1036	RMICHAEL74@AOL.COM	16204 SAGEBRU	TAMPA	FL	33618	Electrical	264389755	SLBE	Caucasian
TAMCO Electric, Inc.	813-986-3472	813-986-5979	atrujill@tampabay.rr.com	4022 W South A	Tampa	FL	33614	Electrical	91396630	SLBE	Hispanic American

New Tampa Recreation Center Addition

Project #18-C-00040

SLBE Availability Contact List

Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
Allen Masonry & General Contracting, Inc.	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	2049 Waikiki Way	Tampa	FL	33619	Concrete and Masonry	993752366	SLBE	African American
CARIA CONSTRUCTION, INC	813-304-7158		Carly@puleosconcrete.com	18803 cherrybirch	Lutz	FL	33558	Concrete and Masonry	63665283	SLBE	Caucasian
Exclusive Contractors, Inc.	863-559-1039	000-000-0000	roadcontractor2@YAHOO.com	277 S. 10th Ave	Bartow	FL	33830	Concrete and Masonry	992345574	SLBE	African American
Fresh Start Development, Inc.	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburgh	Tampa	FL	33619	Concrete and Masonry	203857845	SLBE	African American
JNandlal Maintenance Services of Florida, Inc.	813-679-7769	813-654-7675	JamesNandlal@msn.com	3008 King Phillip	Sefner	FL	33584	Concrete and Masonry	760821164	SLBE	Caucasian
Kilgore Construction, LLC	727-755-2294	727-581-5724	jo@kilgorellc.com	11697 Walsingham	Largo	FL	33778	Concrete and Masonry	763771464	SLBE	Caucasian
MASONRY & CONSTRUCTION SERVICES, INC.	813-981-0196		masonrylg@hotmail.com	13452 N. Florida	Tampa	FL	33613	Concrete and Masonry	762240950	SLBE	Hispanic American
Parking Lot Striping Service Inc.	813-623-1454	813-664-0140	fernandoplss@aol.com	3901 E LAKE AVENUE	TAMPA	FL	33610	Concrete and Masonry	760324264	SLBE	Hispanic American
Quick Construction Solutions, LLC	813-377-9997	813-374-5849	quickcs@outlook.com	4501 N. Saint Vincent	Tampa	FL	33614	Concrete and Masonry	900972890	SLBE	Hispanic American
WC Boxes, Inc.	813-478-1102	813-864-4386	wcindustries2003@gmail.com	17620 Lake Key	Odessa	FL	33556	Concrete and Masonry	772682190	SLBE	African American
Allen Masonry & General Contracting, Inc.	813-597-3289	813-436-0999	allenmasonrygc@gmail.com	2049 Waikiki Way	Tampa	FL	33619	Masonry	993752366	SLBE	African American
CARIA CONSTRUCTION, INC	813-304-7158		Carly@puleosconcrete.com	18803 cherrybirch	Lutz	FL	33558	Masonry	63665283	SLBE	Caucasian
Fresh Start Development, Inc.	813-758-5345	813-333-5949	freshstartdevelop@yahoo.com	601 S Falkenburgh	Tampa	FL	33619	Masonry	203857845	SLBE	African American
JNandlal Maintenance Services of Florida, Inc.	813-679-7769	813-654-7675	JamesNandlal@msn.com	3008 King Phillip	Sefner	FL	33584	Masonry	760821164	SLBE	Caucasian
Kilgore Construction, LLC	727-755-2294	727-581-5724	jo@kilgorellc.com	11697 Walsingham	Largo	FL	33778	Masonry	763771464	SLBE	Caucasian
MASONRY & CONSTRUCTION SERVICES, INC.	813-981-0196		masonrylg@hotmail.com	13452 N. Florida	Tampa	FL	33613	Masonry	762240950	SLBE	Hispanic American

New Tampa Recreation Center Addition

Project #18-C-00040

SLBE Availability Contact List

Business Name	Phone	Fax	Email	Address 1	City	State	Zip	Business Description	FEIN	Cert. Type	Ethnicity
P&H STUCCO & CONSTRUCTION INC.	727-934-9049	727-934-9049	olgaangel7@msn.com	1705 Sunset Drive	TARPON SPRING	FL	34689	Masonry	93220391	SLBE	Caucasian
Paragon Building Contractors, Inc.	813-935-1600	813-932-1108	aldavisparagon@gmail.com	1201 W WATER	TAMPA	FL	33604	Masonry	92464751	SLBE	African American
WC Boxes, Inc.	813-478-1102	813-864-4386	wcindustries2003@gmail.com	17620 Lake Key	Odessa	FL	33556	Masonry	72682190	SLBE	African American
Precision Roofing Solutions, Inc.	813-264-6262		dan@prstampa.com	P.O. Box 27145	Tampa	FL	33688	Roofing	64325793	SLBE	Caucasian
Pro-Fit Development, Inc.	813-514-8783	813-231-8866	Info@Pro-FitDevelopment.com	4007 N Taliaferro	Tampa	FL	33603	Roofing	32013650	SLBE	African American
Reeves Building and Plumbing Company	813-238-6197	813-238-6197	ReevesBuilding@verizon.net	P O BOX 11724	TAMPA	FL	33680	Roofing	93011515	SLBE	African American
Advanced Door Services, Inc.	813-759-4300		Ispradling@advanceddoorservices.com	1602 E Alsobrook	Plant City	FL	33563	Doors & Windows	11515179	SLBE	Caucasian
Capitol Carpet Care, Inc.	813-990-8900	813-990-8919	herrerad40@gmail.com	4726 N. Lois Ave	Tampa	FL	33614	Flooring	91992098	SLBE	Hispanic American
Capitol Carpet Maintenance LLC	813-990-8900	813-990-8919	cccarpet1@gmail.com	4726 N. LOIS AVENUE	Tampa	FL	33614	Flooring	08176357	SLBE	Hispanic American
Faithful Cleaning Service to the Reliance	813-210-3616	813-980-2428	faithfulcleaningservice17@yahoo.com	9824 Morris Glen	Tampa	FL	33637	Flooring	113724609	SLBE	African American
Floor Installation Service, Inc.	813-664-8600	813-664-8611	sales@floorinstallationservice.com	5410 Boran Drive	Tampa	FL	33610	Flooring	91560828	SLBE	Caucasian
Flooring Worx, Inc.	813-341-0170	813-855-5944	Jenclark@flooring-worx.com	475 B Roberts Road	Oldsmar	FL	34677	Flooring	63878396	SLBE	Caucasian
GEYEN GROUP SOUTH INC	813-882-9655	813-882-0325	MARLEEN@GEYENGROUP.COM	1708 WEST CYPRESS	TAMPA	FL	33606	Flooring	202019686	SLBE	Caucasian
Guaranteed Installations, Inc.	813-931-8453	813-931-8457	Lauradecicco1@verizon.net	9420 Lazy Lane	Tampa	FL	33614	Flooring	61721307	SLBE	Caucasian
Gulf Coast Floors, Inc.	813-655-5599	813-655-8500	Ecamp@gulfcoastfloors.com	10311 Woodberry	Tampa	FL	33619	Flooring	32078101	SLBE	Caucasian
Mom & Daughter's Team LLC	727-657-5576		momanddaughter@yahoo.com	4883 58th St N	Kenneth City	FL	33709	Flooring	14091364	SLBE	Hispanic American
Ocean Flooring, Inc	813-870-0967	813-870-2132	hguarino@oceanflooring.biz	4721 N. Clark Avenue	Tampa	FL	33614	Flooring	92852308	SLBE	Caucasian

**New Tampa Recreation Center Addition
Project #18-C-00040
SLBE Availability Contact List**

[illegible]

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.	Estimated Quantity	Description and Price in Words	Computed Total Price for Item in Figures
BASE BID	LS	<p>The work includes the furnishing of all labor, equipment, and material for the construction of a 7400 square foot addition to the existing recreation building including new multipurpose room, preschool gym, training room, restrooms and storage along with new chiller to support existing building and addition and related mechanical, electrical and plumbing (MEP) work along with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications <i>in accordance with the contract</i>, 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.</p> <p>_____ dollars and _____ cents</p> <p>(BASE BID) LS \$ _____</p>	

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 (or affirmed) before me this ____ day of _____, 20____ by _____ as _____ of _____, a/n ☐ Partnership ☐ Joint Venture ☐ LLC ☐ Corp ☐ Other: _____, on behalf of such entity. Such individual is ☐ personally known to me or ☐ produced a/n _____ state driver's license as identification.

For an individual: The forgoing instrument was sworn (or affirmed) before me this ____ day of _____, 20____ by _____, who is ☐ personally known to me or ☐ produced a/n _____ state driver's license as identification.

[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.



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.



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 (GFECP) 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 18-C-00040; New Tampa Recreation Center Addition

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 18-C-00040, New Tampa Recreational Center Addition.

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 18-C-00040 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 18-C-00040; New Tampa Recreation Center Addition, shall include, but not be limited to, construction of a 7400 square foot addition to the existing recreation building including new multipurpose room, preschool gym, training room, restrooms and storage along with new chiller to support existing building and addition and related mechanical, electrical and plumbing (MEP) work along with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications 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 condition(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 items 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 or (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

Bob Buckhorn, Mayor
(SEAL)

ATTEST:

City Clerk

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

Rachel S. Peterkin, 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 foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ of _____, a _____ corporation, on behalf of the corporation. He/she is ____ personally known or has ____ produced _____ as identification.

Notary

My Commission Expires:

For an Individual:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ who is ____ personally known to me or has ____ produced _____ as identification.

Notary

My Commission Expires:

For a Firm:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ of _____, 20__ by _____ who signed on behalf of the said firm. He/she is ____ personally known or has ____ produced _____ as identification.

Notary

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.

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

TEMPORARY STRUCTURES

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 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

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.

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.

SECTION 13 CLEANING

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	Company Name Address Phone & Fax	Total Sub Contract Or PO Amount	Amount Paid To Date	Amount To Be Paid For This Period
Trade/Work Activity			Amount Pending Previously Reported	Sub Pay Period Ending Date
[]Sub []Supplier				
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 may result in non-compliance).**

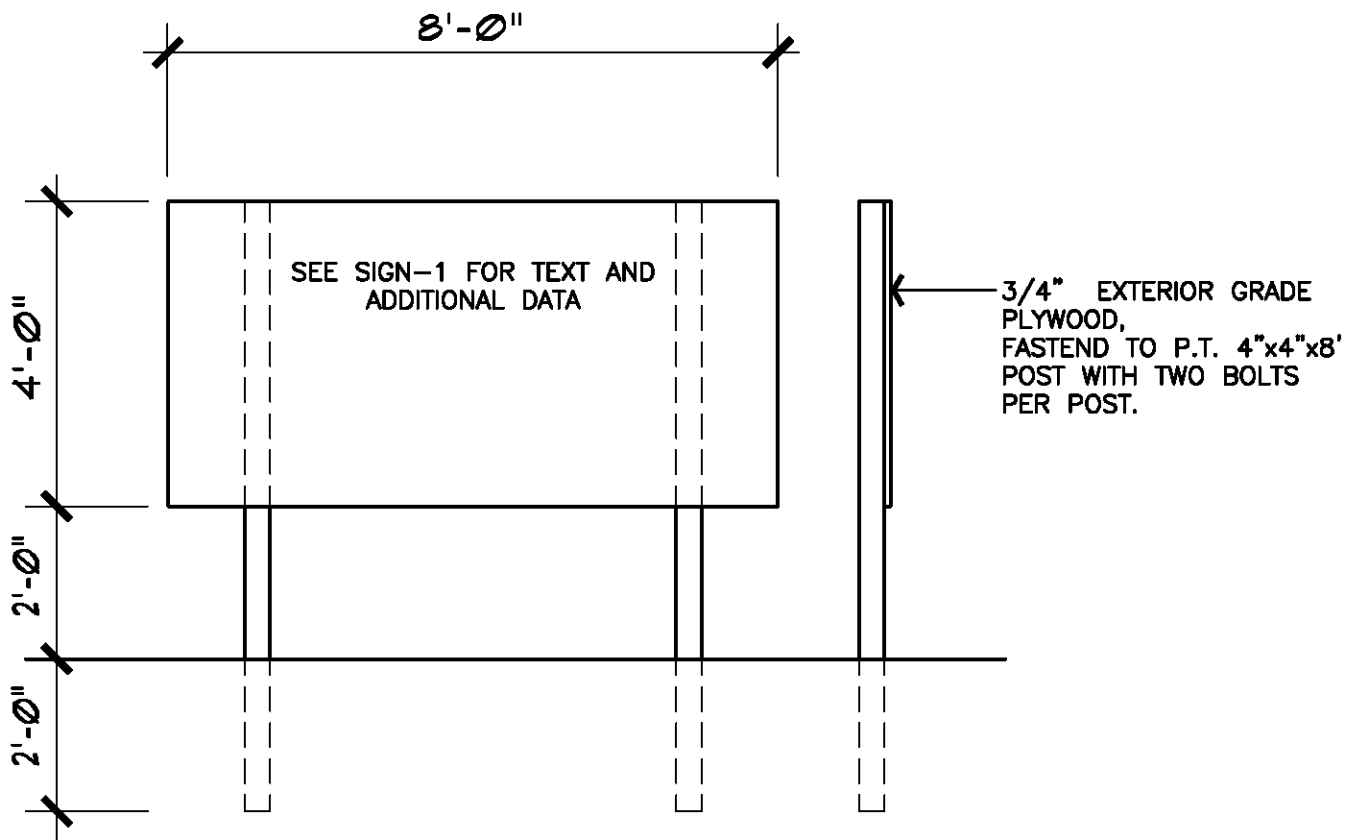
- **Contract No.** This is the number assigned by the City of Tampa for the bid or proposal.
- **W.O.#** If the report covers a work order number (W.O.#) for the contract, please indicate it in that space.
- **Contract Name.** This is the name of the contract assigned by the City of Tampa for the bid 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.



SECTION 01010 - SUMMARY OF WORK

1.0 GENERAL:

The work shall consist of furnishing all materials, labor, equipment, tools, and all items and services required for the complete construction in conformity with Contract Documents of:

New Tampa Recreational Center Addition
at
17302 Commerce Park Blvd
Tampa, FL 33647
for the
City of Tampa

All construction work and materials, in addition to complying with requirements of Contract Documents, shall fully comply with all requirements of local building codes, all ordinances, and regulations of other Federal, State and public authorities having jurisdiction over this type of work in the given area.

2.0 SCOPE:

The work shall include but not be limited to, an 7400 square foot addition to the existing recreation building, including new multipurpose room, preschool gym, training room, restrooms and storage along with new chiller to support existing building and addition and related mechanical, electrical and plumbing (MEP) work along with all associated work required for a complete project, as shown and indicated on the Drawings and in the Specifications in accordance with the contract.

3.0 LEGAL DESCRIPTION OF PROJECT SITE:

Legal description as shown on the drawings, Sheet G-1.

4.0 VERIFICATION OF OWNER'S SURVEY DATA:

Prior to commencing any work, the Contractor shall satisfy himself as to accuracy of all survey data which shall affect his work as indicated in these plans and specifications and/or provided by the City.

Should the Contractor discover any inaccuracies or errors which will affect his work, he shall notify the Engineer and/or Architect in order that proper adjustments can be ordered.

The exact location of the building and related items shall be determined on site jointly by the Contractor and the Engineer and/or Architect. NO work shall commence until said final approval of the locations is made by the Engineer and/or Architect.

5.0 CONTRACT DOCUMENTS:

- a. BIDDING REQUIREMENTS
- b. GENERAL PROVISIONS, SUPPLEMENTARY GENERAL PROVISIONS, AND SPECIAL CONDITIONS

6.0 SPECIFICATIONS: (DATED: December 2018)

Divisions: 1, 2, 5, 6, 8, 9, 10, 13

7.0 DRAWINGS: (DATED: December 2018)

Sheets: Cover Sheet, Civil Cover Sheet, C-1, C-2, C-3, C-4, C-5, C-6, C-7, A-1.1, A-2.1, A2.2, A6.1, A7.1, S1.1, S1.2, S1.3, S2.1, S2.2, S2.3, S3.1, S3.2, S3.3, S3.4, S4.1, S4.2, S4.3, S4.4, S4.5, M1.0, M1.1, M2.1, M2.2, M2.3, M2.4, P0.0, P1.0, P2.0, FP0.0, FP1.1, FP1.2, FP5.1, E0.1, E0.2, E0.3, E0.4, E1.1, E3.1, E2.1, E4.1, E5.1, E5.2, E5.3, E6.1, E6.2, E7.1, E7.2, E7.3,

8.0 ADDENDA AND LETTERS OF CLARIFICATION:

All addenda and letters of clarification issued prior to bid opening time date.

SECTION 01020 - ALLOWANCES

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

SUMMARY

This Section includes administrative and procedural requirements governing allowances.

Types of allowances include the following:

Contingency allowances.

SELECTION AND PURCHASE

SUBMITTALS

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

Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

CONTINGENCY ALLOWANCES

Use the contingency allowance only as directed by the Owner.

Work Directive Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

At Project closeout, credit unused amounts remaining in the contingency allowance to the Owner by Change Order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

EXAMINATION

Examine products covered by an allowance promptly upon delivery for damage or defects.

PREPARATION

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.

SCHEDULE OF ALLOWANCES

Allowance No. 1: Include a contingency allowance of \$100,000 for use according to the Owner's instructions. The allowance shall be included in the Base Bid.

END OF SECTION 01020

SECTION 01040 - PROJECT COORDINATIONPART 1 - GENERALRELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

SUMMARY

This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

- Coordination.
- Administrative and supervisory personnel.
- General installation provisions.
- Cleaning and protection.

COORDINATION

Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

Make adequate provisions to accommodate items scheduled for later installation.

Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

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:

- Preparation of schedules.
- Installation and removal of temporary facilities.
- Delivery and processing of submittals.
- Progress meetings.
- Project Close-out activities.

Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

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.

SUBMITTALS

Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

Show the interrelationship of components shown on separate Shop Drawings.

Indicate required installation sequences.

Refer to Sheet M.02 – Mechanical Specifications; Part 1 – “General Requirements” and Sheet P.01 – Plumbing General; Part 1 – “General Requirements” and Sheet E.02 – Electrical; Part 1 - General; “General Scope” for specific coordination drawing requirements for mechanical, plumbing and electrical installations.

Staff Names: At the Preconstruction Conference, 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.

Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable).PART 3 - EXECUTIONGENERAL INSTALLATION PROVISIONS

Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

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.

Recheck measurements and dimensions, before starting each installation.

Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

CLEANING AND PROTECTION

During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

Limiting Exposures: Supervise construction activities 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. Where applicable, such exposures include, but are not limited to, the following:

- Excessive static or dynamic loading.
- Excessive internal or external pressures.
- Excessively high or low temperatures.
- Thermal shock.
- Excessively high or low humidity.
- Air contamination or pollution.
- Water or ice.
- Solvents.
- Chemicals.
- Light.
- Radiation.
- Puncture.
- Abrasion.
- Heavy traffic.
- Soiling, staining and corrosion.
- Bacteria.
- Rodent and insect infestation.
- Combustion.
- Electrical current.
- High speed operation,
- Improper lubrication,
- Unusual wear or other misuse.
- Contact between incompatible materials.
- Destructive testing.
- Misalignment.
- Excessive weathering.
- Unprotected storage.
- Improper shipping or handling.
- Theft.
- Vandalism.

END OF SECTION 01040

SECTION 01045 - 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.

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.

Demolition of selected portions of the courts 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:

- 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 surface 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 01045

SECTION 02070 - SELECTIVE DEMOLITION

PART 1 - GENERAL:

RELATED DOCUMENTS:

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

DESCRIPTION OF WORK:

Extent of selective demolition work is indicated on drawings.

Types of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:

Portions of building structure and site improvements indicated on drawings and as required to accommodate new construction.

Removal and protection of existing fixtures and equipment items indicated "salvage".

JOB CONDITIONS:

Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

Storage or sale of removed items on site will not be permitted.

Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.

Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

Protect floors with suitable coverings when necessary.

Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

Remove protections at completion of work.

Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

Explosives: Use of explosives will not be permitted.

Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

INSPECTION:

Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

PREPARATION:

Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

DEMOLITION:

Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

SALVAGE MATERIALS:

Salvage Items: Where indicated on Drawings as "Salvage-Deliver to Owner", carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.

Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain the property of the Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

DISPOSAL OF DEMOLISHED MATERIALS:

Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.

If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project site.

CLEAN-UP AND REPAIR:

Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02070

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to work of this Section.
- B. Specification 03290 – Under Slab Vapor Barrier / Retarder.

1.2 DESCRIPTION OF WORK

- A. Provide cast-in-place concrete work as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified;
 - ACI 301 "Specifications for Structural Concrete for Buildings."
 - ACI 304 "Recommend Practice for Measuring, Mixing, Transporting, and Placing Concrete."
 - ACI 311 "Recommend Practice for Concrete Inspection."
 - ACI 315 "Manual of Standard Practice for Detailing Concrete Structures."
 - ACI 318 "Building Code Requirements for Reinforced Concrete."
 - ACI 347 "Recommend Practice for Concrete Formwork."
 - Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
- B. Full Cooperation shall be given to mechanical, electrical, and plumbing installers to allow them time to coordinate and install all items of their work which are to be encased or built into concrete. Contractor to assure that other work such as sleeves, electrical conduits, pipes, anchors, etc., are properly placed and secured in position before concrete is placed. Items that require inspection shall have been inspected and tested for both material and mechanical operation and shall have been completed before concrete is placed.

1.4 SUBMITTAL

- A. Shop Drawings: Submit for review shop drawings for all concrete work showing reinforcement, bending details, bar schedules, stirrup spacing, and placing details for all reinforcement.
- B. Shop drawings shall bear the initials of both the detailer and checker to indicate that said shop drawings have been checked by the shop prior to submission. Any error, including omissions, coordination, and errors in dimensions shown on shop drawings shall be the responsibility of the Contractor. Prepare shop drawings in sufficient time to allow the Architect 14 calendar days from his receipt of the full set in which to review and check same.

- C. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually. Formwork shop drawings must be signed and sealed by a professional engineer in the state of Florida.
- D. Mix Designs: Submit for review lab test reports for concrete materials and mix designs as specified. Provide test data sample with standard deviation calculations for each mix submitted.
- E. Mill Reports: Submit for information purposes only mill reports covering the chemical and physical properties of reinforcing as specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Store materials to permit easy access for inspection and identification. Keep reinforcing steel under cover and off the ground using supports. Protect reinforcing steel from rusting, oil, grease, or distortion.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces with a rigid non-absorptive material to offer optimum appearance and leave a smooth, stain-free surface. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without objectionable bow or deflection.
- B. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
- C. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- D. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- E. Form Ties: Provide factory-fabricated, adjustable-length, removable metal form ties with cones on each side, designed to prevent deflection, and to prevent spalling concrete surfaces upon removal.
- F. Unless otherwise indicated, provide form ties which will leave a hole not larger than 1" diameter in the concrete surface.
- G. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely

affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 CONCRETE MATERIALS

- A. Portland Cement: Portland Cement shall conform to ASTM C150, Type 1.
- B. All cement shall be from the same mill and manufacturer to insure cement of uniform color and shade for all exposed concrete.
- C. High early strength Portland cement or other special cement shall be used only when authorized by the Architect.
- D. Fly Ash: ASTM C618, Type F., 20% max.
- E. Fine Aggregate: Fine aggregate shall be clean, natural siliceous sand consisting of hard, strong, durable, uncoated particles, and shall conform to the requirements of ASTM C33.
- F. Coarse Aggregate for Stone Concrete: Coarse aggregate for stone concrete shall consist of clean, hard, uncoated, strong, durable gravel or crushed stone and shall conform to the requirements of ASTM C33.
- G. Color and source of aggregates shall be approved by the Architect after review of mock-up samples. All aggregates for each class of concrete used shall be from the same source to insure that concrete is of uniform color and shade.
- H. Water: Water for mixing and curing concrete shall be potable and shall not contain amounts of impurities injurious to the concrete. Drinkable.

2.3 REINFORCING MATERIALS

- A. Reinforcing Steel: Reinforcing steel must be correctly rolled to section and free from all surface defects and shall be in accordance with ASTM A615 Grade 60 as evidenced by manufacturer's certificates. The grade of steel shall be intermediate, new billet stock. All bars shall be deformed and rolled with raised symbols to identify the manufacturer and the size of the bar.
- B. Welded Wire Mesh shall conform to ASTM A185 and ASTM A82 (FY = 65 ksi). Flat sheets only.
- C. Steel Wire: The Wire shall be No. 18 U.S. Steel wire gauge black annealed wire.
- D. Supports for Reinforcement: Spacer bars, slab bolsters, chairs, wiring, nails, and other accessories shall be standard commercial metal supports, and plastic or stainless steel where exposed to weather, or where rust could impair architectural finishes. Use chairs with plastic tips on all framed slabs.

2.4 ADMIXTURES

- A. General: No admixtures other than those listed below shall be used in concrete mixes after design mix approval. Admixtures shall contain no more chloride ions than are present in municipal drinking water. Certification of conformance to requirements and the

chloride ion content will be required from the admixture manufacturer prior to mix design review to the Architect. Upon request only, provide a qualified, full-time representative to assure proper use of admixtures.

- B. Water Reducing Admixture: The water-reducing admixture "Eucon WR-75" manufactured by the Euclid Chemical Company, "Plastocrete 161" manufactured by the Sika Chemical Corporation, or "Pozzolith 322N" manufactured by Master Builders Company or equal shall be used in all concrete. The admixture shall conform to ASTM C494, Type A, and shall not contain more chloride ions than are present in municipal drinking water.
- C. High Range Water Reducing Admixture (Superplasticizer): "Eucon 37" by The Euclid Chemical Company or "Sikament" by Sika Chemical Corporation, may be used in all pumped concrete and concrete with a water-cement ratio below 0.50. The admixture shall conform to ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
- D. Non-Corrosive, Non-Chloride Accelerator: "Accelguard 80" by the Euclid Chemical Company or "Pozzolith LL880" by Master Builders. The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. It shall be used in all concrete placed at temperatures below 50 degrees F.
- E. The admixture manufacturer must have long-term, non-corrosive test data from an independent testing laboratory (of a least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
- F. Water Reducing Retarder Admixture: The water reducing retarder admixture "Eucon Retarder-75" manufactured by the Euclid Chemical Company, "Plastocrete 161R" manufactured by Sika Chemical Corporation or "Pozzolith 100-XR" manufactured by Master Builders or approved equal, shall not contain more chloride ions than are present in municipal drinking water.
- G. Air Entraining Admixture: The air-entraining admixture shall conform to ASTM C260 and shall be used where necessary to achieve the specified air content.
- H. Calcium Chloride: Calcium chloride, thiocyanate, or admixture containing more than 0.05% chloride ions are not permitted.
- I. Air Content: Air content of concrete shall be as follows:
 - 1. For concrete exposed to soil and/or weather, 5%+ 1.5%.
 - 2. 3% for all other concrete.

2.5 RELATED MATERIALS

- A. Joint Filler: Expansion joint fillers shall be asphalt impregnated fiber board conforming to ASTM D-1751. Joint fillers shall extend full depth of slab or joint and be thickness and lengths indicated on drawings.
- B. Anchor Slots: Hot-Dipped galvanized, #22 ga. metal, felt filled, equal to No. 305 made by Hohman & Bernard or approved equal.
- C. Inserts: Inserts shall be either adjustable, threaded or wedge types depending on use as

manufactured by Hohman & Bernard or approved equal.

- D. Non-Shrink Grout: Pre-mixed non-shrink grout as called for on drawings shall be manufactured by:
 - 1. The Euclid Chemical Company - "Euco N-S Group" (All exposed grout).
 - 2. The Euclid Chemical Company - "Firmix".
 - 3. Master Builders - "Embeco 885".
 - 4. Anto-Hydro Company - "Axpandcrete Metalics."
 - 5. Sonneborn - "Ferrolith G".
 - 6. Lambert Corporation - "Vibropruf #11".
- E. Vapor Barrier: Provide under slab vapor barrier / retarder as per specification section 03290
- F. Curing Compounds:
 - A. Manufacturer: Subject to compliance with requirements, products incorporated in the work shall be one of the following:
 - 1. "Clear Bond"; Guardian Chemical.
 - 2. "Master Seal"; Master Builders.
 - 3. "Abco Cure N Seal 830"; Nox-Crete.
 - 4. "Crystal Gard - 0800"; Lambert Corporation.
- G. Absorptive Cover: Burlap cloth made from Jute or Kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- H. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene coated burlap.
- I. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicate per gal.
- J. Plastic Reglets: Provide "Type A" prefilled P.V.C. reglets where indicated, made by the Superior Concrete Accessories, Inc. Install in strict accordance with manufacturers details and directions.
- K. Bonding Compound: The Compound shall be a two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces, "Euco Epoxy #463 or #615" by the Euclid Chemical Company or "Sikadur Hi-Mod" by Sika Chemical Corporation.

PART 3 - EXECUTION

3.1 FORMS

- A. Forms shall be so constructed that the finished concrete will conform to the shapes, lines,

and dimensions shown on the Contract drawings. They shall be substantially built and sufficiently tight to prevent leakage of water or paste and securely braced in order to maintain their true position and shape. If any form loses its proper shape or position, it shall immediately be repaired to the satisfaction of the Architect or removed and replaced with a new form.

- B. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor.
- C. Wetting and Oiling Forms: The inside surface of woodboard forms shall be soaked with clean water prior to placing concrete. Unfinished plywood or presswood forms (except as otherwise specified herein) shall be treated with an approved form oil or lacquer. If oil is used, all excess oil shall be wiped off with rags to leave the surface of the forms just oily to the touch. Oil is not to be applied after reinforcing is in place.

3.2 VAPOR RETARDER/BARRIER INSTALLATION

- A. General: Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour. Follow Specification section 03290.
- B. Lap joints 6 inches and seal as per manufacturer's recommendations. See specification section 03290.

3.3 CONCRETE PROPORTIONS

- A. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318-89 and as noted below. Preparation of mix designs are the responsibility of the Contractor. If trial batches are selected as the method of proportioning, the mix design shall be proportioned to achieve an average 28-day compressive strength of 1200 psi in excess of the design strength indicated on the Contract drawings. All proposed mixes shall be submitted with complete standard deviation analysis or trial batch data for the Architect's review a minimum of 14 days prior to the use of the mix.
- B. Limit use of fly ash to not exceed 20 percent of cement content by weight.
- C. Water-Cement Ratio: Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

5000-psi, 28-day compressive strength; W/C ratio, 0.42 maximum (non-air-entrained), 0.32 maximum (air-entrained).

4000-psi, 28-day compressive strength; W/C ratio, 0.45 maximum (non-air-entrained), 0.35 maximum (air-entrained).

3500-psi, 28-day compressive strength; W/C ratio, 0.48 maximum (non-air-entrained), 0.40 maximum (air-entrained).

3000-psi, 28-day compressive strength; W/C ratio, 0.52 maximum (non-air-entrained), 0.46 maximum (air-entrained).

2500-psi, 28-day compressive strength; W/C ratio, 0.54 maximum (non-air-entrained), 0.50 maximum (air-entrained).

- D. All concrete required to be watertight shall have a maximum water-cement ratio of 0.40. All reinforced concrete subjected to brackish water, salt spray or de-icers shall have a maximum water-cement ratio of 0.40. All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.45.
- E. Lightweight Concrete - Proportion mix as specified. Design mix to produce strength and modulus of elasticity as noted on drawings, with a splitting tensile strength factor (Fct) of not less than 5.5 for 3000-psi concrete and a dry weight of not less than 95 lbs. or more than 110 lbs. after 28 days. Limit shrinkage to 0.03 percent at 28 days.
- F. Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.
- G. Use high-range water-reducing admixture (HRWR) in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.
- H. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- I. Slump Limits - Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Ramps slabs, and sloping surfaces - Not more than 3 inches.
 - 2. Reinforced foundation systems - Not less than 1 inch and not more than 4 inches.
 - 3. Concrete containing HRWR admixture (Superplasticizer) - Not more than 8 inches after addition of HRWR to site-verified 2-inch to 3-inch slump concrete.
 - 4. Other concrete - Not more than 4 inches.
- J. Cement, aggregate, cylinder molds, and other materials required for design or verification mixes by the laboratory shall be supplied by the Contractor. The test lab cost shall be at the expenses of the Contractor.
- K. Measurements of fine and coarse aggregate shall be made separately by weight. The proportioning of aggregate for fractional sacks of cement will not be permitted unless the cement is weighed for each batch. Weighing equipment shall be arranged to permit making compensation for changes in the weight of moisture contained in the aggregate.

3.4 MIXING

- A. General: The mixing shall be done by the use of modern, efficient, mechanical equipment and devices satisfactory to the Architect for accurately controlling and easily checking the weight of each of the ingredients. The Architect shall have free access to the plant at all time for sampling the materials, or inspection of the work.
- B. Concrete mixers shall be of the revolving drum type. Each batch shall be mixed for not less than 2 minutes after the water has been added at the rate of rotation specified by the

manufacturer. The concrete shall be discharged completely before the mixer is recharged.

- C. Ready-mixed concrete, shall be mixed and delivered as specified for central-mixed or truck-mixed concrete in ASTM C94. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

3.5 PLACING REINFORCEMENT

- A. Fabrication: Reinforcement fabricated to the shapes and dimensions shown or required shall be in place where indicated on the drawings, or as required to comply with the Contract Documents.
- B. Tags: Reinforcing bars shall be furnished with identification tags.
- C. Cleaning: Before any reinforcement is placed, any loose rust or mill scale, or coatings, including ice or oil, which would reduce or destroy the bond shall be removed. Reinforcement material reduced in section shall not be used.
- D. Concrete cover over steel reinforcement shall not be less than that permitted by "Building Code Requirements for Reinforced Concrete, ACI 318" or as shown on the drawings.
- E. Positioning: Bar reinforcement shall be carefully formed to the shapes shown and required to resist most effectively the stresses involved. Bars with kinks or bends not required shall not be used. The reinforcement shall not be bent or straightened in a manner that would injure the material. The heating of reinforcement for bending or straightening will not be permitted.
- F. Bends or hooks, unless otherwise shown or required, shall be cold formed around pins. Hooks shall be ACI Standard.
- G. Securing Reinforcement: Reinforcement shall be wired securely at intersections and shall be held in place with approved bars, spacers, chairs, high chairs, bolsters, or other supports so that it will not be dislocated or otherwise disturbed during the depositing of concrete.
- H. Splices: Steel reinforcement shall not be spliced at points of maximum stress. Laps shall be tied and seized tight at both ends. See drawings for lap lengths and details.
- I. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.6 CONVEYING AND PLACING

- A. General: Concrete shall be conveyed from the mixer to the forms as quickly as possible by method which will prevent segregation and loss of materials. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling. Special care shall be exercised to prevent splashing of forms or reinforcement with concrete in advance of pouring. Concrete shall be deposited in a continuous manner until

a given unit of construction, as approved by the Architect, has been completed.

- B. Temporary Runways: Delivery carts and/or buggies where used shall be kept on temporary runways built over the construction, and runway supports shall not bear upon reinforcing steel or fresh concrete.
- C. Maximum Time: Concrete shall not be incorporated in the work after it has attained its initial set nor in any event more than 1-1/2 hours after water has been added to the dry materials, or more than 1-1/2 hours after cement has been added to aggregate. This period may be reduced at the option of the Architect if it develops that presetting is taking place, particularly in hot weather.
- D. Redosage with the specified high range water-reducing admixture (superplasticizer) may be permitted with the approval of the Architect as to methods and procedure.
- E. Vertical Drop: Concrete containing the specified high range water-reducing admixture (superplasticizer) shall not be allowed to drop freely more than 10 feet. Maximum drop for other concrete shall be 6 feet. Provide placement holes in formwork, chutes, or elephant trunks for placement of concrete where the drop exceeds these limits.
- F. Patching: After form approval, repairable defective areas shall be immediately patched.
- G. Repair of Defective Areas: With prior approval of the Architect, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Chapter 9, except that the specified bonding compound must be used.
- H. All structural repairs shall be made with prior approval of the Architect as to method and procedure, using the specified epoxy adhesive and/or epoxy mortar. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.

3.7 COMPACTION AND VIBRATION

- A. General: Concrete shall be consolidated with the aid of mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping to force out air pockets, to work the materials into corners and around reinforcement and embedded items, and to eliminate honeycomb. Concrete shall not be moved horizontally over long distances with the use of mechanical vibrator. Use and type of vibrators shall be in strict conformance with ACI 309, "Recommended Practice for Consolidation of Concrete".

3.8 COLD WEATHER PLACEMENT

- A. In temperatures of 40 deg. F and above, when it is not anticipated that temperatures will drop below 40 deg. F., no special protection is required for placing concrete other than providing heated concrete and the means of maintaining concrete temperatures of at least 50 deg. F. for a period of seven (7) days after placing. If high early strength concrete is used, this time period may be reduced to three (3) days.
- B. For temperatures below 40 deg. F., concrete must be delivered to the project site at between 55 deg. F. and 70 deg. F. Water shall not be heated over 180 deg. F. Concrete

work shall be protected by wind breaks, curing compounds, and blanket covers if necessary in order to maintain the concrete in-place temperatures of at least 50 deg. F. for five (5) days.

- C. Non-Corrosive, Non-Chloride Accelerating Admixture shall be used as previously specified. In no case shall calcium chloride, thiocyanate, or admixtures containing more than 0.05% chloride ions be used.
- D. Heating Methods: All methods proposed for heating materials, and protecting the concrete shall be subject to approval by the Architect. Concrete shall never be heated over 90 deg. F. nor will any other overheating which would produce a flash set be permitted.

3.9 WARM AND INCLEMENT WEATHER PLACEMENT

- A. During very warm weather, the concrete shall be delivered to the forms at the coolest practicable temperature. In no case shall concrete above 90 deg. F. be placed. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
- B. When high temperatures and/or placing conditions dictate, the Contractor shall use the water-reducing, retarding formulation (Type D) in lieu of the specified water-reducing admixture (Type A) as specified. Concrete shall not be placed when the sun, heat, wind, rain, sleet, or humidity would prevent proper placement.

3.10 CONSTRUCTION JOINTS

- A. Where indicated, construction joints shall be of the types and at the locations specified on the drawings or as requested by the Architect on the shop drawings. All other construction joints shall be resubmitted for the Architect's approval.
- B. Shear Keys: Construction joints shall be provided with adequate shear keys for succeeding placements and reinforcement shall be continuous through such joints, unless otherwise noted on the drawings.
- C. Joint Spacing: Unless otherwise noted, the maximum spacing of construction joints shall be as follows:
 1. Foundation walls: forty-five (45) feet.
 2. Slabs: Fifteen (15) feet.

3.11 BONDING

- A. General: Before any new concrete is deposited on or against concrete that has hardened, the form shall be retightened, the surfaces of the hardened concrete shall be roughened as required, thoroughly cleansed of foreign matter, dampened and the specified bonding compound applied. The forms shall then be retightened. New concrete shall be placed after the bonding compound has dried.

3.12 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 3 days.
- C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- D. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.
- E. Provide moisture curing by following methods:
 - 1. Keep concrete surface continuously wet by covering with water.
 - 2. Continuous water-fog spray.
 - 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- F. Provide moisture-cover curing as follows:
 - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with side and ends lapped at least 3" and sealed by waterproof tape or adhesive.
 - 2. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- G. Provide curing compound to slabs as follows:
 - 1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Maintain continuity of coating and repair damage during curing period.
 - 2. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
- H. Chemical Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3 strength, second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat, and allow 24 hours for drying between coats.

3.13 CONCRETE FINISHES

- 1. Troweled Finish: All concrete slabs, except as noted below but including those that

- shall receive resilient flooring, tile with a thin set application, or carpet shall be screeded level to the established elevations, thoroughly consolidated and bullfloated. When slabs have set sufficiently, machine float and then trowel with a steel trowel.
2. Concrete shall be in condition acceptable to trades that will furnish and install the finish materials.
 3. During the floating and troweling operations, care shall be taken that no holes or depressions are left from the removal of coarse aggregate and that no excess moisture or bleed water is present on the surface. The trowel finished surface shall be level so that the surface conforms to an F25 number as measured by the "Dipstick" or an optical device approved by the Architect.
 4. Exposed surfaces: Provide smooth rubbed finish to exposed surfaces (except floor slabs), which have received smooth form finish treatment, not later than one day after form removal. Moisten concrete surfaces, and rub with abrasive until a uniform texture is produced. Do not apply cement grout other than that created by rubbing. Immediately repair defective surfaces and remove excess paste from adjacent surfaces.
 5. Scratched Finish: For slab surfaces intended to receive bonded applied "mud set" cementitious applications, ceramic tile or quarry tile, etc., after the concrete has been placed, struck-off consolidated and leveled, the surface shall be roughened with stiff brushes or rakes before final set.
 6. Rough Finish: Rough concrete finish shall be used for all other concrete for which no other finish is indicated or specified. Obtain by using clean, straight lumber, plywood, or metal forms. Concrete having a rough finish shall have honeycombing and minor defects patched.
 7. Sidewalk Finishes: Unless noted otherwise, sidewalk shall have broom finish.
 8. Rock salt finish - Where noted on Architectural Plans, sidewalks shall receive rock salt treatment by hand sprinkling onto wet concrete surface and tamping. Provide a 4 sf sample for Architect approval.

3.14 BUILT IN ITEMS

- A. Mechanical, Electrical and Plumbing installers shall be given time to coordinate and install all items of their work which are to be encased in concrete.

3.15 TESTING AND INSPECTION

- A. General: The Owner shall pay for the services of a test laboratory for concrete inspection. Retesting of any material that fails to meet the specified standards and testing of any material that has replaced rejected material shall be paid by the Contractor. Contractor shall coordinate his work with testing laboratory and shall cooperate in the testing procedure.
- B. Certified copies of mill reports covering the chemical and physical properties of the steel used in the work shall be furnished at the Contractor's expense.
- C. Codes: The Testing Laboratory will test the concrete for compliance with contract documents and all applicable ACI and ASTM codes and standards.
- D. Understrength Concrete: If, in the opinion of the Contractor, test cylinders that fail to meet the strength requirements are not truly representative, he may have the right to cut cores

from the work affected.

- E. Such cores shall be not less than 3 in number and shall comply as to size and shape and shall be secured and tested in conformance with the requirements of ASTM C42. The cores shall be taken at points mutually agreeable to the Contractor and the Architect, and shall be tested at points mutually agreeable to the Contractor and the Architect, and shall be tested in the presence of the Architect by a laboratory approved by the Architect. All costs incurred shall be borne by the Contractor. If test results are not satisfactory to the Architect, the Contractor shall remove from the work all affected concrete and replace such defective work in a satisfactory manner, all without further compensation.
- F. Contractor's Responsibility: The sole responsibility for producing concrete in the field having the strength required without causing excessive shrinkage cracks shall rest on the Contractor, regardless of the laboratory determination. If, in his opinion, the field conditions are such that a lower water-cement ratio is necessary to produce the required strength, he shall submit the mix he proposes to use to the Architect in writing. In no case will the Contractor be permitted to use a higher water-cement or lower cement factor than those used in the approved mix.

3.16 TESTING DURING PROGRESS OF WORK

- A. Batch Plant Inspection by the Testing Laboratory, if authorized, will include:
 - 1. Attendance at the batching plant during all batching.
 - 2. Determination that all weighing and measuring equipment is in proper working order and that calibration certificates of scales are current.
 - 3. Determination that the truck mixers are regularly cleaned and maintained and that the drums revolve at the proper speeds.
 - 4. Ascertain that only correct weights of cement and aggregate are used.
 - 5. Ascertain that only those admixtures as specified and in proper qualities are used in mix.
 - 6. Ensure that only the correct amount of mixing water is loaded into the tank of the truck.
 - 7. Ensure that only approved materials are used.
 - 8. Ascertain that aggregated and water are of the proper temperature.
 - 9. Make necessary tests of the aggregates to determine the moisture content so that the total water in the batch may be properly adjusted.
 - 10. Test of aggregates received at the batching plant for gradation and cleanliness.
 - 11. Check and sign delivery tickets issued by supplier that will identify each load of concrete dispatched to the project as having been inspected when directed by the Architect.
- B. Field Inspection by the Testing Laboratory, if authorized, will include:
 - 1. Attendance at the project site during all concrete placing operations.
 - 2. Ascertain that concrete delivered to the site has been inspected by the batch plant inspector, if so directed by Architect.
 - 3. Control the addition of mixing water in order to maintain the required water/cement ratio.
 - 4. Ascertain that the concrete is conveyed from the mixer to the point of pour in accordance with specifications and good practice.

5. Ascertain that the concrete is of the proper temperature when placed.
-
- C. Air Contents Tests: At least two tests shall be made for each day's placing or from each batch of concrete from which cylinders are cast. Tests shall be representative of each type of concrete.
 - D. Slump Tests: At frequent intervals to properly control the consistency and at least one at time of casting each group of cylinders and at least one test for every 25 cubic yards. Test should be done at point of discharge.
 - E. Concrete Compression Cylinders: Unless otherwise specified, there shall be taken from the concrete of each strength placed on any one day at least one set of five representative 6"x12" test cylinders. For large placements on any one day there shall be taken not less than one set of five representative type cylinders for each 50 cubic yard more than the first 25 cubic yards of each type of concrete placed in any one day.. Two cylinders to be tested at 7 days, two at the age of 28 days and the fifth cylinder in reserve for further testing. Ascertain that the test specimens are properly protected until shipped to the testing laboratory. Record and identify each cylinder with the location of the concrete from which the specimen was taken. Keep marking in sequence. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test (same day, same placement) results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
 - F. Additional Test Lab Responsibilities: Report any material or work performed that fails to meet the job specifications immediately with the Contractor, and then to the Architect. Work will be checked as it progresses. Failure to detect any defective work or materials shall not in any way prevent later rejections or obligate the Architect for final acceptance.
 - G. Reports on Inspection: 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 Contract Documents, either at the plant or project site, will be rejected by the Testing Laboratory and Immediately reported to the Contractor and then 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, contractor's name, and date work was performed.
 - H. Report Copies and Timing: Immediately after tests or inspections have been made and in no case late than seven (7) days after tests of inspection have been made, the laboratory shall furnish copies of all test and inspection reports.
 - I. Batch Plant Inspection Daily Report: The batch plant inspectors shall submit a daily report that shall contain the following data:
 1. Concrete supplier.
 2. Weather conditions and air temperature (ranges).
 3. Type of concrete.
 4. Required strength of concrete.
 5. Total number of batches, batch weight, and identifying number of each batch and

- truck load.
6. Basic control data concrete mix, indicating mix number source, and type of cement, source of aggregates, type of admixtures, basic quantities of cement, aggregates (dry), water and admixtures of concrete per cubic yard, required slump, required air entrainment and water/cement ratio.
7. Actual data and quantities of concrete batch, indicating time of batching, actual quantities of cement, aggregates (moist) and admixtures, gallons of water added to plant; percent of total moisture in aggregates; temperature of aggregates and water, gallons of water to be added in transit or at site; time truck dispatched from plant.
8. Name of inspector, with time of arrival and departure from batch plant and total hours for day.
9. Site Inspection Daily Report: The site inspectors shall submit a daily report which shall contain the following data:
 10. Concrete supplier.
 11. Weather conditions and air temperature (ranges).
 12. Type of concrete placed.
 13. Location of placed concrete and time of starting and stopping of placement.
 14. Identification of truck loads.
 15. Amount of water added in transit or at site.
 16. Time of discharging concrete from truck.
 17. Temperature of concrete during discharging from truck and during placing.
 18. Slump test results, identifying truck load and cylinders made.
 19. Air entrainment test results, identifying truck load.
 20. Test cylinders cast, identifying cylinder number, design strength, time taken, slump, truck numbers from which taken and location of pours with yardage of concrete placed at each location.
 21. Name of inspector, with time of arrival and departure from site and total hours for day.
 22. Cylinder Test Reports: Reports on test cylinders for 7 and 28 day tests (also show 7-day data on 28 day report).
 23. Location of pour and specific location represented by cylinders.
 24. Date cast.
 25. Date tested.
 26. Age of test.
 27. Number of days cured in laboratory.
 28. Required strength.
 29. Actual strength.
 30. Type of fracture.
 31. Consistency as measured by slump.
 32. Air content (if air entrained concrete).
 33. Weight of cylinders as received.
 34. Temperature of concrete when placed.

END OF SECTION

SECTION 04230 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Provide each type of reinforced unit masonry work as indicated on drawings and in schedules and specified herein.
- B. Requirements of Section 04200, "Unit Masonry" apply to work of this section.

1.3 SUBMITTALS

- A. Shop Drawings - Submit shop drawings for fabrication, bending, and placement of reinforcement 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General - Refer to Section 04200 for masonry materials and accessories not included in this section.
- B. Reinforcement Bars - Provide deformed bars of Grade 60 complying with ASTM A 615.
- C. Shop-fabricate reinforcement bars that are shown to be bent or hooked.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT

- A. General - Clean reinforcement of loose rust, mill scale, earth, ice or other materials that will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).
- C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to the Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

3.2 INSTALLATION, GENERAL

- A. Refer to Section 04200 for general installation requirements of unit masonry.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. General

1. Do not wet concrete masonry units (CMU).
2. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

B. Walls

1. Pattern Bond - Lay CMU wall units in 1/2 stack bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells on non-reinforced vertical cells, or provide units with solid bottoms.

4. Grouting

- a. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in one or both horizontal directions.
5. Use "Course Grout" per ASTM C476 for filling 4" spaces or larger in both horizontal directions.

C. Low-Lift Grouting

1. Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
2. 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.
3. 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.
4. 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.
5. 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.

END OF SECTION

SECTION 05100 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division - 1 Specification Sections apply to work on this Section.

1.2 DESCRIPTION OF WORK

- B. Provide structural steel work as shown on drawings and specified herein. Structural steel is that work defined in AISC "Code of standard Practice" and as otherwise shown on drawings.
- C. Related Work Specified Elsewhere:
 - 1. Steel Joists: Section 05210
 - 2. Metal Decking: Section 05300

1.3 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Comply with provisions of following, except where more stringent requirements are shown or specified:
 - 2. AISC "Code of Standard Practice for Steel Buildings and Bridges."
 - 3. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including the "Commentary" and Supplements thereto as issued.
 - 4. 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.
 - 5. AWS D1.1 "Structural Welding Code," latest editions.
 - 6. 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 Contractor's responsibility and at his expense.

1.4 COORDINATION

- A. Contractor shall fully coordinate the structural steel work. Coordinate with Metal Deck Installer for hoisting of the metal deck.

- B. Contractor shall fully verify all dimensions and details. Any discrepancies shall be immediately reported to the Architect.
- C. Contractor 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. Contractor shall set the anchor bolts and inserts. Contractor 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. Contractor 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 Contractor, 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. Contractor shall coordinate erection areas and sequence and temporary bracing locations.

1.5 SUBMITTALS

- A. Product Data
 - 1. Submit 4 copies of 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).
 - 2. Structural Steel (each type), including certified copies of mill reports covering the chemical and physical properties.
 - 3. High strength bolts.
 - 4. 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.

1.6 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 Contractor 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
 1. 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
 1. 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 that 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. The Contractor shall have a properly calibrated torque gauge on hand, and when requested by the Architect, shall 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.
2. Structural Steel Shapes, Plates, and Bars: ASTM A36
3. Steel Pipe: ASTM A53, Types E or S, Grade B.
4. Anchor bolts shall conform to ASTM A307 with size and shape as indicated on the drawings.
5. Column Base Plates: ASTM A36
6. Arc Welding Electrodes shall conform to the AWS Code as Revised. All electric current require shall be furnished by Contractor.
7. Paint for Shop Painting Structural Steel and Field Touch-up shall be manufacturer's standard primer.
8. 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.

PART 3 - EXECUTION

3.1 ERECTION

A. General

1. 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

1. 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

1. 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. Contractor shall set anchor bolts and other insert anchors required.

D. Field Assembly

1. 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 that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

E. Temporary Shoring and Bracing

1. 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. Coordinate locations of temporary bracing with the Contractor.

2. Splice members only where indicated.
3. 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.
4. Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing.

F. Touch-up Painting

1. Immediately after erection, clean field welds, bolted connections, and abraded 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 film thickness of 2.0 mils.

3.2 TESTING AND INSPECTION

A. General

1. The Owner shall pay for the services of a Test Laboratory for steel inspection. The Test Laboratory shall be selected by the Architect.
2. Certified copies of mill reports covering the chemical and physical properties of the steel used in the work shall be furnished at the Contractor's expense.
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 the Project Site, will be rejected by the Testing Laboratory or 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, Contractor'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

SECTION 05300 - METAL 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

- B. Provide metal decking as shown on the drawings, including basic layout and type of deck units required, and specified herein.
- C. Related Work Described Elsewhere:
 - 1. Structural Steel: Section 05100
 - 2. Steel Joists: Section 05210

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise shown or specified:
 - 1. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
 - 2. AWS "Structural Welding Code."
 - 3. SDI "Design Manual for Floor Decks and Roof Decks."
 - 4. 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. Remove and replace work found to be defective and not complying with requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Uplift Loading
 - 1. Install and anchor roof deck units to resist the net uplift loading indicated in the design load schedule of the construction drawings.
- B. Underwriter's Label:
 - 1. 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. Product Data

1. Submit four copies of 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.

B. Shop Drawings

1. 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.

1.6 COORDINATION

- A. Contractor shall coordinate loading of deck units on the steel frame and erection sequence with Structural Steel Installer. Contractor shall coordinate the actual size and depth of sump pans.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Deck

1. Roof Deck Units: Roof deck shall be as indicated in the "Roof Framing Notes" in the roof plan.
2. Floor Deck Units: Floor deck shall be as indicated in the "Floor Framing Notes" in the floor plan. See drawings for specific location of application.
3. 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.
4. 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

1. Install deck units and accessories in accordance with manufacturer's recommendations and approved shop drawings, and as specified herein.
2. 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.
3. Place deck units in straight alignment for entire length of run.
4. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
5. Coordinate and cooperate with structural steel installer in loading decking bundles to prevent overloading of structural members.
6. Do not use floor deck units for storage or working platforms until permanently secured.
7. End Closures: Tack weld or use machine screws at 3'-0" o.c. for fastening end closures.
8. 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.
9. 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.
10. 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.
11. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.
12. 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.
13. 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.
14. Touch-up painted surfaces with the above specified paint applied in accordance with the manufacturer's instructions.

END OF SECTION

07550 - MODIFIED BITUMEN MEMBRANE ROOFINGPART1 GENERAL1.01 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Deviations: In the event this Specification deviates from the manufacturer's current specification, this specification prevails, except where they conflict with the manufacturer's requirements for the specified guarantee. In this case, the manufacturer's specification prevails.
- C. Specification Amendments: Drawings, addenda and modifications may be issued subsequent to the printing of this Specification.
- D. Contractor Acceptance: Prior to the project start, ascertain that all aspects of this Specification and possible modifications are workable and do not conflict with the manufacturer's requirements for the specified guarantee. Upon commencement of the work, it will be presumed that this Specification and drawings, addenda and modifications are satisfactory to both the Contractor and the manufacturer in their entirety.
- E. Supplied Materials: Supply all materials of the roofing system, including accessory products. The bidding Contractor, by making his bid, represents that his bid price is based on the use of the materials listed in Part 2 Products. Refer to Part 1.03 Description of Work for specific use within each roofing assembly outlined.

1.02 REFERENCE STANDARDS

References in these specifications to standards, test methods, and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.

<u>ASTM</u>	American Society for Testing and Materials Philadelphia, PA
<u>FM</u>	Factory Mutual Engineering and Research Norwood, MA
<u>NRCA</u>	National Roofing Contractors Association Rosemont, IL
<u>OSHA</u>	Occupational Safety and Health Administrations Washington, DC
<u>SMACNA</u>	Sheet Metal and Air Conditioning Contractors National Association Chantilly, VA
<u>UL</u>	Underwriters Laboratories Northbrook, IL.

CCRC Cool Roof Rating Council
Oakland, CA

1.03 DESCRIPTION OF WORK

The basic work descriptions (components, layering and attachment methods) required in this specification are referenced below.

Siplast Roof System Specification #: 2030 WSH

Project Type: New

Deck: Metal

Slope: Positive Drainage

Slope: Minimum 1/8 inch per foot. - See Drawings

Roof System: Siplast Paradiene 20 TG mid sheet torch applied.

Siplast Paradiene 30 CR FR TG granual cap torch applied.

Flashing system: Siplast Vera! Aluminum, torch applied.

Specialty Flashing System: Siplast Parapro 123 Catalyzed Acrylic Resin Flashing System - fully adhere.

1.04 QUALITY ASSURANCE

- A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.
- B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third-party auditor under the ISO 9001:2000 audit process. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.
- C. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.
 1. Underwriters Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.
 2. Factory Mutual Approval Standard 4470 listing for the proposed membrane system. The roof membrane configuration shall be approved by FM for Class 1-SH (severe hail) exposure. The roof configuration (including fastening of base sheet or insulation) shall be approved by FM for minimum 1-150 windstorm construction.

- D. **Acceptable Contractor:** Contractor shall have a minimum of 2 years experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.
- E. **Scope of Work:** The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings, furnish competent and full-time supervision, experienced roof mechanics, all materials (unless noted otherwise), tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.
- F. **Local Regulations:** Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
- G. **Manufacturer Requirements:** Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conduct a final inspection upon successful completion of the project.

1.05 GUARANTEE/WARRANTY

- A. **Roof System Guarantee (Siplast 20 Year Roof System Guarantee):** Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roof system manufacturer's 20-year labor and materials roof system guarantee. The roof system guarantee shall include both the roofing and flashing membranes, and the specified new lightweight insulating concrete system consisting of aggregate fill, patented-pre-formed polystyrene panels, and base sheet fasteners. All repair or replacement costs covered under the guarantee shall be borne by the roofing membrane manufacturer. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner. Specific items covered under the roof system guarantee include:
 - 1. The actual resistance to heat flow through the roof insulation will be at least 80% of the design thermal resistance, provided that the roofing membrane is free of leaks;
 - 2. The roof insulation will remain in a reroofable condition should the roof membrane require replacement (excluding damage caused by fastener pullout during removal of the old membrane.)
 - 3. The roof insulation will remain in place even if the roof membrane sustains wind damage covered by the guarantee.

1.06 SUBMITTALS

All submittals which do not conform to the following requirements will be rejected.

- A. **Submittals following Contract Award:**

1. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
2. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.

B. Submittals Prior to Project Close-out:

1. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.07 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
- B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.
- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.
- D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.08 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to

ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.

C. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
2. Torch Safety: Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas of roof construction. Continue the fire watch after roofing material application has been suspended for the day.
3. limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.
6. Asbestos Containing Roofing Materials - Removal: Remove and dispose of any and all asbestos materials including asbestos containing roof materials (ACRM) in a manner which creates no hazard to the workers, the building occupants, or the environment. Follow local, state and federal laws, codes and ordinances during handling, demolition, removal and dumping of ACRM. Provide permits and certification letters in order to comply with all local, state and federal regulations pertaining to this project.

D. Removal of existing and installation of temporary and permanent roof systems shall be performed in a manner to avoid disruption of the use and operation of the building.

PART 2 PRODUCTS

2.01 DESCRIPTION OF SYSTEMS

A. Roofing Membrane Assembly (Siplast Paradiene 20 TG/30 CR FR TG roof system): A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, applied over a prepared substrate. Both reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14°F (-10°C). Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

1. Modified Bitumen Base and Stripping Ply (Siplast Paradiene 20 - torchable grade):

- a) Thickness (avg): 114 mils (2.9 mm) (ASTM D 5147)
- b) Thickness (min): 110 mils (2.8 mm) (ASTM D 5147)
- c) Weight (min per 100 ft² of coverage): 76 lb (3.7 kg/m²)
- d) Maximum filler content in elastomeric blend: 35% by weight
- e) Low temperature flexibility@ -13° F (-25° C) - PASS (ASTM D 5147)
- f) Maximum Load (avg)@ 73°F (23°C): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
- g) Maximum Load (avg)@ 0°F (-18°C): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
- h) Elongation@ 5% Maximum Load (avg.) @73°F (23°C): 50% (ASTM D 5147)
- i) Dimensional Stability (max): 0.1% (ASTM D 5147)
- j) High Temperature Stability (min): 250°F (121°C) (ASTM D 5147)
- k) Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
- l) Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria

2. Modified Bitumen Finish Ply (Siplast Paradiene 30 CR FR - torchable grade):

- a) Thickness (avg): 180 mils (3.8 mm) (ASTM D 5147)
- b) Thickness at selvage (coating thickness) (avg): 118 mils (3.0 mm) (ASTM D 5147)
- c) Thickness at selvage (coating thickness) (min): 114 mils (2.9 mm) (ASTM D 5147)
- d) Weight (min per 100 ft² of coverage): 112 lb (5.4 kg/m²)
- e) Maximum filler content in elastomeric blend: 35% by weight
- f) Low temperature flexibility@ -13°F (-25°C): PASS (ASTM D 5147)
- g) Maximum Load (avg)@ 73°F (23°C): 30 lbf/inch (5.3 kN/m) (ASTM D 5147)
- h) Maximum Load (avg)@ 0°F (-18°C): 75 lbf/inch (13.2 kN/m) (ASTM D 5147)
- i) Elongation @5% Maximum Load (avg.) @73°F (23°C): 55% (ASTM D 5147)
- j) Dimensional Stability (max): 0.1% (ASTM D 5147)
- k) High Temperature Stability (min): 250°F (121° C) (ASTM D 5147)
- l) Granule Embedment (max loss): 2.0 grams per sample (ASTM D 5147)
- m) Approvals: UL Class listed, FM Approved (products shall bear seals of approval)
- n) Reinforcement: fiberglass mat or other meeting the performance and dimensional stability criteria
- o) Surfacing: ceramic granules (white synthetic chips)

B. Flashing Membrane Assembly (Siplast Veral flashing system, aluminum finish): A flashing membrane assembly consisting of a prefabricated, reinforced, Styrene- Butadiene-Styrene (SBS) block copolymer modified asphalt membrane with a continuous, channel-embossed metal-foil surfacing. The finish ply shall conform to ASTM D 6298 and the following physical and mechanical property requirements.

1. Metal-Clad Modified Bitumen Flashing Sheet (Siplast Veral Aluminum):

- a) Thickness (avg): 142 mils (3.6 mm) (ASTM D 5147)
- b) Thickness (min): 138 mils (3.5 mm) (ASTM D 5147)
- c) Weight (min per 100 ft² of coverage): 92 lb (4.5 kg/m²)
- d) Coating Thickness- back surface (min): 40 mils (1 mm) (ASTM D 5147)
- e) Maximum filler content in elastomeric blend: 35% by weight
- f) Low temperature flexibility@ 0° F (-18° C): PASS (ASTM D 5147)
- g) Maximum Load (avg)@ 73°F (23°C): 85 lbf/inch (15 kN/m) (ASTM D 5147)
- h) Maximum Load (avg)@ 0°F (-18°C): 180 lbf/inch (31.7 kN/m) (ASTM D 5147)
- i) Elongation@ 5% Maximum Load (avg)@ 73°F (23°C): 45% (ASTM D 5147)
- j) Tear-Strength (avg): 120 lbf (0.54 kN) (ASTM D 5147)

- k) Dimensional Stability (max): 0.2% (ASTM D 5147)
- l) High Temperature Stability (min): 225°F (107°C) (ASTM D 5147)
- m) Cyclic Thermal Shock Stability (maximum): 0.2% (ASTM D 6298)
- n) Approvals: UL Approved, FM Approved (products shall bear seals of approval)
- o) Reinforcement: fiberglass scrim mat or other meeting the performance and dimensional stability criteria
- p) Surfacing: aluminum metal foil

C. Flashing Reinforcing Ply- (Same as roof system base ply- refer to Section 07550-2.02.A.1.)

D. Catalyzed Acrylic Resin Flashing System (Parapro 123 Flashing System by Siplast/Icopal; Irving, TX): A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application.

2.02 ROOFING ACCESSORIES

A. Bituminous Cutback Materials

1. Primer (Siplast PA-1125 Asphalt Primer by Siplast / Icopal; Irving, TX): A high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D 41 requirements.
2. Mastics (Siplast PA-1021 Plastic Cement by Siplast / Icopal; Irving, TX): An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements.

B. Caulking/Sealants (Siplast PS-304 Elastomeric Sealant by Siplast / Icopal; Irving, TX): A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:

C. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.

D. Metallic Powder: A finely graded metal dust as supplied or approved by the membrane manufacturer, used for covering of bitumen overruns over the foil surfaced membrane.

E. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt-based coating. The face of the cant shall have a nominal 4-inch dimension.

F. Fasteners

1. Base Sheet Fasteners: Base sheet fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable base sheet fasteners for specific substrate types are listed below.

- a. Wood Nailer Fasteners (Tapper Concrete Screws by Powers Fastener, Inc.):
 - Stainless steel screws, nominal 1/4-inch diameter, providing for a minimum 1 inch embedment. Fasteners in 6 inch or wider lumber should be installed in 2 rows staggered 1/3 of the nailer width. Maximum 12-inch o.c. spacing between adjacent fastener rows at the perimeter, 6 inches o.c. at the corners. Corner fastener spacing should extend 8 feet from all outside building comers. Install 2 fasteners within 6 inches of each nailer end.

2.03 RELATED COMPONENTS

- A. Rough Carpentry: Lumber used for nailers, curbs, and cants shall be No. 2 kiln dried (19% maximum moisture content after treatment), grade marked, and surfaced on four sides. Lumber shall be salt treated with Wolman Salts (wood shall retain 0.25 lbs. dry salt per cubic foot of wood) or an approved equal.
 - 1. Perimeter Nailers for Edge Metal Securement. Lumber shall have a nominal 6-inch width with a thickness to match the height of the new insulation assembly.
- B. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt-based coating. The face of the cant shall have a nominal 4-inch dimension.
- Moisture Relief Vents For Lightweight Insulating Concrete Substrates: Insulated, spun aluminum roof vents having a one-way valve design. An acceptable type is the Aluminum Insulvent (one-way) by Marathon Roofing Products, Inc. Note that roof vents constructed of plastic are not acceptable.
- D. Lead Drain Flashings: Formable type, weighing a minimum of 4 lb. per square foot; in sheets of minimum 30-inch x 30-inch dimension.
- E. Lead Pipe Flashings: Preformed from sheet stock weighing a minimum of 4 lb. per square foot, and soldered with a minimum 4 inch perimeter flange with a sleeve opening fabricated to fit closely around the penetration without forcing. Lead sleeve length shall be of sufficient height to allow a minimum of 1 inch to be crimped inside of the pipe stack.
- F. Fabricated Metal (Refer to Sections 07600 and 07620): Fabricate all metal components to be used in conjunction with the roof system using material specified, detailed and approved.
 - 1. Metal Edge/Fascia: Fabricate metal edge/fascia incorporating a 4-inch perimeter flange with a minimum 1/4-inch gravel stop rise. The fascia shall be of sufficient width to adequately cover the roof assembly/wall juncture. The bottom edge of the fascia shall have a minimum 1/2-inch drip edge, hemmed and formed at 30 degrees and shall be fabricated for attachment to a continuous cleat at the outside base of the nailer. Fabricate metal edge/fascia in maximum 10 feet sections. Fabricate corner pieces of metal edge fascia with 1-foot sections in either direction from the corner. Fabricate cover plates and accessory components in accordance with

SMACNA guidelines.

2. Metal Pipe Flashings: Fabricate metal pipe flashings in a two-component assembly in accordance with the following:

The first component shall be a metal roof jack having a minimum 4 inch perimeter flange, and a sleeve opening to fit closely around the penetration without forcing, with a minimum 6 inch height. Fasten and solder metal laps.

- The second component shall be a metal, water tight umbrella, fabricated to be mechanically secured tightly around the roof penetration and extend beyond the roof jack opening by a minimum radius of 3 inches. Caulk top edge of the watertight umbrella using an approved sealant.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Pre-Job Conference: Conduct a pre-job conference to include the designer, Owner, roofing Contractor and manufacturer's representative prior to application of roofing.
- B. Foremen: Provide the roofing foreman with a copy of these specifications to be available at the job site at all times. The presence of specifications and an inspector shall not relieve the Contractor of strict compliance with the manufacturer's specifications, detail drawings, and/or approved material requirements.
- C. Deck Penetrations: Verify that work penetrating the roof deck, or which may otherwise affect the roofing application, has been properly completed.
- D. Final Inspection - post installation meeting: Arrange a meeting at the completion of the project to be attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.

3.02 SUBSTRATE REQUIREMENTS

- A. Roof Decks: Structural roof decks should properly provide sufficient strength to support anticipated dead and live loads and normal construction traffic without excessive deflection or movement. All openings, walls or projections through the roof deck should be completed before application of the roof membrane is begun. Necessary deck repairs should be made according to the deck manufacturer's specifications following best established practices.

3.03 SUBSTRATE PREPARATION

- A. Perimeter Wood Nailers: Install perimeter wood nailers in accordance with the guidelines set forth in latest edition of Factory Mutual Loss Prevention Bulletin 1-49.
- B. Base Sheet Securement to Prepared Substrate: Lay the base sheet over the entire area to be roofed, lapping sides 3 inches and ends 6 inches. Using the specified fasteners, fasten each sheet every 7 inches through laps and stagger fasten the remainder of the sheet in 3 rows on nominal 9-inch centers with fasteners in each row on 10 inch centers. Increase the fastening pattern at the corners/perimeter in accordance with the recommendations set forth in Factory Mutual Loss Prevention Bulletin 1-29.

3.04 ROOF MEMBRANE INSTALLATION -GENERAL

- A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.
- B. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules and metallic powder, and exercise care in ensuring that the finished application is acceptable to the Owner.
- C. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.
- D. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.
- E. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
 - 1. Apply all layers of roofing perpendicular to the slope of the deck.
 - 2. Fully bond the base ply to the prepared substrate, utilizing minimum 3-inch side and end laps. Apply each sheet directly behind the torch applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
 - 3. Fully bond the finish ply to the base ply, utilizing minimum 3-inch side and end laps. Apply each sheet directly behind the torch applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
 - 4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.
- F. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.
- G. Flashing Application - masonry surfaces: Flash masonry parapet walls and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, fully adhere the reinforcing sheet, utilizing minimum 3 inch

side laps and extend a minimum of 3 inches onto the base ply surface and 3 inches up the parapet wall above the cant. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three-foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9-inch centers. (See manufacturer's schematic for visual interpretation).

- H. Flashing Application - wood surfaces: Flash wood or plywood parapet walls and curbs using the reinforcing sheet and the metal foil flashing membrane. The reinforcing sheet shall have minimum 3-inch side laps and extend a minimum of 3 inches onto the base ply surface and to the top of the parapet wall or curb. Nail the reinforcing sheet through the field of the sheet to the vertical wood surface on 12-inch centers from the top of the cant to top of the wall or curb. Fully adhere the remainder of the flashing reinforcing sheet that extends over the cant and roof level. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three-foot widths (cut off the end of roll) always lapping the factory selvage edge. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9-inch centers. (See manufacturer's schematic for visual interpretation).
- I. Use of Metallic Powder: Broadcast metallic powder over all bitumen overruns on the metal foil membrane surface while the bitumen is still hot to ensure a monolithic surface color.
- J. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing. Maintain roof drains in operation at all times. Provide sump pumps as needed to remove standing water.
- K. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.

3.05 RELATED COMPONENTS- INSTALLATION

The following is a list of verbal descriptions for correct installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. Prime the flange with a uniform coating of approved ASTM D 41 asphalt primer and allow to dry thoroughly; all flanges must be set in the specified mastic.

- A. Edge Metal (coordination with Sections 07600 and 07620): Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down 2 inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every 3 inches on center. Strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the gravel-stop rise of the edge metal. Refer to Section 07550 - 3.06.G, Sealant, for completion of this work.
- B. Lead Pipe Flashings: Completely prime the lead flanges and allow to dry prior to installation. After the base ply has been applied, set the flange in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. Refer to Section 07550 - 3.06.G, Sealant, for completion of this work.
- C. Lead Drain Flashings: Completely prime the lead drain flashing and allow to dry prior to installation. After the base ply has been applied, set the lead flashing sheet in mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of 4 inches. Terminate the finish ply to extend beneath the clamping ring seal. Install the clamping ring with all bolts in place.
- D. Roof Moisture Relief Vents - non-vented lightweight insulating concrete substrates: Completely prime the metal flanges and allow to dry prior to installation. After the base ply has been applied, mark the venting designations. Cut a 2-diameter core from the roof assembly down to the top surface of the embedded Insulperm expanded polystyrene panels. Fill the resulting void with fiberglass insulation. Set the vent flange in mastic, centered over the core cut. Strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-throat juncture of the vent. Refer to Section 07550 - 3.06.G, Sealant, for completion of this work.
- E. Metal Pipe Flashings: Completely prime the metal pipe flanges and allow to dry prior to installation. After the base ply has been applied, set the flanges in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. Install a watertight umbrella to the penetration, completely covering the opening of the pipe flashing. Refer to Section 07550 - 3.06.G, Sealant, for completion of this work.
- F. Walktread: Cut the walktread into maximum 5-foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8-inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.
- G. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.06 SPECIAL CONDITIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials,

equipment and related items after completion of job.

- B. Notification Of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection
 - 1. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- D. Issuance Of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION 07

SECTION 023610 – TERMITE CONTROL

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 the following:
 - 1. Soil treatment with termiticide.

1.3 PERFORMANCE REQUIREMENTS

- A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

1.4 SUBMITTALS

- A. Product Data: For termiticide.
 - 1. Include the EPA-Registered Label for termiticide products.
- B. Product Certificates: For termite control products, signed by product manufacturer.
- C. Qualification Data: For Installer of termite control products.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.
- C. Source Limitations: Obtain termite control products through one source.

1.6 PROJECT CONDITIONS

- A. 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.

1.7 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

- A. 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. 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: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Termiticides:
 - a. BASF Corporation, Agricultural Products; Termidor.
 - b. Bayer Environmental Science; Premise 75.
 - c. FMC Corporation, Agricultural Products Group; Dragnet FT, Transport Termiticide.
 - d. Syngenta; Demon TC, Prelude, or Probuild TC.

2.2 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all 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, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 1. Slabs-on-Grade: 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: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Masonry: Treat voids.

4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building.
 - 2. Demolition and removal of selected site elements.
 - 3. Patching and repairs.

1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Demolish: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- C. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.
- D. Remove, store and reinstall.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of interior and exterior construction and site improvements that might be misconstrued as damage caused by selective demolition operations.
- C. Record drawings at Project.

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- D. Proposed dust-control and noise-control measures.
- E. Schedule of selective demolition activities indicating the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 2. Interruption of utility service.
 3. Coordination of shut-off, capping, and continuation of utility services.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at project site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 - a. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

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. Do not interrupt existing utilities and services to the occupied portion of the building during construction without prior owner approval. Coordinate any interruption of services with the owners schedule. Do not block building egress.
- B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Storage or sale of removed items or materials on-site will not be permitted.
- D. Asbestos, Lead Paint, and Mold: Refer to notes on the architectural drawings and reports referenced there for requirements regarding abatement, remediation, and/or removal of these items.
- E. Hazardous Materials:

1. Asbestos, Lead Paint, and Mold: Refer to notes on the architectural drawings and reports referenced there for requirements regarding abatement, remediation, and/or removal of these items.
2. If additional suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials unless noted otherwise.
 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Conduct periodic surveys as the work progresses to detect hazards from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 1. Arrange to shut off indicated utilities with utility companies.
 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the site before proceeding with selective demolition.
 3. 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 after bypassing.

- D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

E Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walks, fences, and railings, where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
 - 4. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
 - 5. Cover and protect furniture, furnishings, and equipment that have not been removed.
- C. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
 - 1. Strengthen or add new support when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
 - 1. 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. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Maintain adequate ventilation when using cutting torches.
 - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 6. Locate selective demolition equipment throughout the structure 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. On-site storage or sale of removed items is prohibited.
 - 8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools except for floor slab and sidewalk demolition..
- C. Remove air-conditioning equipment without releasing refrigerants.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 - 1. Completely fill holes and depressions in existing walls and partitions to remain with an approved patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- D. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend from one finished area into another. Provide a flush and even surface of uniform color and appearance.
 - 1. Closely match texture and finish of existing adjacent surface.
 - 2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
- E. Patch, repair, or rehang existing ceilings to remain as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- D. Provide for dumpsters to temporarily store demolished materials. Location of dumpsters shall be coordinated with the Owner.

3.8 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. The site/location of selective demolition work shall be kept clean of any and all debris which could present a hazard to persons on site.

END OF SECTION

SECTION 042000 - UNIT MASONRY

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 unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units
 - 2. Decorative concrete masonry units.
 - 2. Mortar and grout.
 - 3. Reinforcing steel.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors
 - 6. Lintels
 - 7. Miscellaneous masonry accessories.
- B. Related Sections include the following:
 - 1. Division 7 Section "Foamed-In-Place Masonry Wall Insulation" for insulation at exterior walls.
 - 2. Section 7 Section "Water Repellents" for water repellents applied to unit masonry.

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths 2,000psi at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314.
 - 1. For Concrete Unit Masonry: As indicated.

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." [Show elevations of reinforced walls.]

- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Each type of masonry unit required.
 - 2. Mortar complying with property requirements of ASTM C 270.
 - 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
- E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Each type of masonry unit required.
 - 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 - 3. Each material and grade indicated for reinforcing bars.
Each type and size of joint reinforcement.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

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 designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT 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 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 coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. 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 ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
 - 1. When ambient temperature exceeds 100 deg F or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

0.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.
 - 1. Provide special shapes for lintels, control joints (sash blocks), bonding, and other special conditions.

2.2 Interior Concrete Masonry Units: ASTM C 90 and as follows:

- 1. Weight Classification: Normal weight.

2. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on drawings:
 - a. 8 inch nominal depth
 - b. 4 inch nominal depth
3. Corners: Provide bullnose at interior corners except where otherwise indicated
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
5. Compressive strength = 2000 psi, minimum, based on net area; f'_m = 1500 psi minimum.

0.3 Exterior Concrete Masonry Units, WATER LEAKAGE-CONTROLLING SPLIT-FACE CONCRETE MASONRY UNITS

A. Comply with ASTM C 90 and as follows:

1. Compressive strength = 2000 psi, minimum, based on net area; f'_m = 1500 psi minimum.
2. Weight Classification: Normal weight.
3. Provide Type II, moisture-controlled units.
4. Sizes:
 - a. Split-Face Single-Score Block Regular 8 inch nominal depth
 - b. Split-Face Single-Score Block Corner 8 inch nominal depth
5. Finish: Split-face finish to match existing.
6. Color: Match existing, two colors (A and B)
7. Integral Water Repellent: Provide units produced with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of the test specimen.
 - a. Control-Blok including Rheomix Rheopel polymeric, integral water-repellent admixture system.

B. Source Quality Control

1. Tests: Perform one test for each production set-up and each 10,000 units for this project.
 - a. Test in accordance with ASTM C 140 for compressive strength, density, and absorption.
 - b. Test in accordance with licensor's quality control program for water permeation resistance.

2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Hot-dip galvanized, carbon-steel wire.
 - 2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
 - 3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
 - 4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For single-wythe masonry, provide truss or ladder type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 LINTELS

- A. Refer to Structural drawings.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from PVC.
- B. Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
 - 1. Provide units with either two loops or four loops as needed for number of bars indicated.

2.8 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.9 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.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Integral Water Repellant admixture shall be used for all mortar at exterior unit masonry walls.
 - a. Dry-Block by Grace Construction Products
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
 - a. At exterior unit masonry use two colors of mortar to match existing construction.
- E. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
 - 2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 - 3. For masonry below grade, in contact with earth, and where indicated, use Type M.
 - 4. For reinforced masonry and where indicated, use Type S.
 - 5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- F. 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 Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual

locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 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 for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at

corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal width dimensions at corners or jambs.
 - D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
 - E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
 - F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
 - G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 - H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
 - I. Build non-load-bearing interior partitions to height indicated.
 1. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the 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.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. 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 and parapet walls.

3. Provide reinforcement not more than 8 inches above and below wall openings and extending 24 inches beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Install preformed control-joint gaskets designed to fit standard sash block.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 1. Construct formwork to conform to shape, line, and dimensions shown. Make it 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 temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.9 FIELD QUALITY CONTROL

- A. Contractor will engage a qualified independent testing agency to perform field quality-control testing indicated below.
 1. Payment for these services will be made by Contractor.
 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed

during construction for each 5000 sq. ft. of wall area or portion thereof.

- C. Mortar properties will be tested per ASTM C 780
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- E. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

3.10 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. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. 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. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 - 4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

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 the following metal fabrications:
 - 1. Metal ladders
 - 2. Elevator pit sump cover
 - 3. Miscellaneous framing and supports for the applications where framing and supports are not specified in other sections.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 - "Structural Steel" section for structural steel framing system components.
 - 2. Division 5 – "Decorative Formed Metal" for break metal beam enclosures
 - 3. Division 9 – "Painting" section for priming and painting of metal fabrications.
 - 4. Division 10 – "Sunshades" for aluminum sunshades

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Samples representative of materials and finished products as may be requested by Architect.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification

1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.2 PAINT

- A. Shop Primer for Ferrous Metal: Refer to Section 09900 – “Painting” for primer requirements.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for reglvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A with hex nuts, ASTM A 563 and, where indicated, flat washers.
- C. Anchors, General: 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.
- D. Post-Installed Anchors: Refer to project Structural drawings for requirements.

2.4 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Remove sharp or rough areas on exposed traffic surfaces.
- F. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other

adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

- Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

- C. Galvanize miscellaneous framing and supports in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.6 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 16 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. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Galvanize and prime exterior ladders, including brackets.

2.7 ELEVATOR PIT SUMP COVERS

- B. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 3/4 inch in least dimension.
- C. Provide steel angle supports as indicated.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim after fabrication in the following locations:

1. Exterior locations.
2. Interior locations where indicated.

2.9 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements of Section 9F – "Paint/Coatings Specification".
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of Section 09900 – "Painting".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

- D. 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 055113 - METAL STAIRS AND RAILINGS

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. Preassembled steel stairs with concrete-filled treads.
 - 2. Steel tube railings.
 - 3. Steel tube handrails attached to walls adjacent 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 recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. 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. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- B. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer registered in the State of Florida and 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 the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, to design stairs and railings.
- 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. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 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 or 1/4 inch (6.4 mm), whichever is less.
- C. Structural Performance of Railings: Railings 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. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS

- A. Metal Surfaces, General: 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. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- D. Stainless Steel Tubing :ASTM A 551, Grade 304.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- D. 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 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.

2.4 MISCELLANEOUS MATERIALS

- A. At Railings for Open Monumental Stair and Fitness Loft 201 provide Shop Primer compatible with stair finish specified for Open Monumental Stair Railing in Division 9 Section – Painting.
- B. At all other locations (including both stair structures and all railings not specifically indicated otherwise) provide Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, 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. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. 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. Stair Welded Connections (see separate requirements for railing welded connections below) At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 welds: partially dressed weld with spatter removed.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Open Monumental Stair
 - a. Fabricate stringers of steel tubes. Provide closures for exposed ends of tubes.
 - b. Construct platforms of steel members as indicated on project structural drawings.
 - 2. Enclosed Exit Stair
 - a. Fabricate stringers of steel plates or channels. Provide closures for exposed ends of channel stringers.
 - b. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
 - 3. Weld stringers to headers; weld framing members to stringers and headers.
 - 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
 - 1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.

2. Directly weld metal pans to stringers; locate welds on top of subreads where they are concealed by concrete fill. Do not weld risers to stringers.
3. Shape metal pans to include nosing integral with riser.
4. At Contractor's option, provide stair assemblies with metal pan subreads filled with reinforced concrete during fabrication.
5. Provide subplatforms of configuration indicated or, if not indicated, the same as subreads. Weld subplatforms to platform framing.

2.7 RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 1. Refer to project drawings for railing design.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 1. At Open Monumental Stair and Fitness Loft 201 finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint as shown in NAAMM AMP 521.
 2. At Enclosed Exit Stair and at Observation Room 210 finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 3 welds: partially dressed weld with spatter removed as shown in NAAMM AMP 521.
- C. Form changes in direction of railings as follows:
 1. By bending or by inserting prefabricated elbow fittings. Do not miter.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. 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. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- G. Connect posts to stair framing by direct welding unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 1. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.8 FINISHES

- A. Finish railing at Open Monumental Stairs and Fitness Loft 201 after assembly per the following requirements.
 - 1. Prepare and prime per requirements indicated in Division 9 Section – Painting.
- B. Finish all metal stairs and any railings not specifically indicated otherwise after assembly per the following requirements.
 - 1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. 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.
- 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. 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.
- F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- G. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 INSTALLING RAILINGS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding to steel supporting members.

2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.

3.3 ADJUSTING AND CLEANING

- 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 (0.05-mm) dry film thickness.

END OF SECTION

SECTION 057500 - DECORATIVE FORMED METAL

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. Beam wraps.
 - 2. Closures and trim.
- B. Related Requirements:
 - 1. Division 7 Section "Sheet Metal Flashing, Fascia and Trim" for items made of formed metal for flashings and trim.

1.3 COORDINATION

- A. Coordinate installation of anchorages for decorative formed metal items. 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 items to Project site in time for installation.
- B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for decorative formed metal.
 - 1. Include plans, elevations, component details, and attachment details.
 - 2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce required units.
- B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs

competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.
- B. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M, commercial steel, exposed or electrolytic zinc-coated, ASTM A 879/A 879M, with steel sheet substrate complying with ASTM A 1008/A 1008M, commercial steel, exposed.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless exposed fasteners are unavoidable or are the standard fastening method.
- B. Anchor Materials:
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.3 PAINTS AND COATINGS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

- C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (1 mm) and support with concealed stiffeners.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

2.5 BEAM WRAPS

- A. Form beam wraps from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.
 - 1. Steel Sheet: 0.060 inch.
 - a. Finish: Baked enamel or Powder coat.

2.6 CLOSURES AND TRIM

- A. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.
 - 1. Steel Sheet: 0.048 inch.
 - a. Finish: Baked enamel or Powder coat.
 - 2. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.
- B. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.
- C. Drill and tap holes needed for securing closures and trim to other surfaces.
- D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.
- E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.7 GENERAL FINISH REQUIREMENTS

- A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
- B. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Color and Gloss: Match existing.
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm). Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.
- E. Color and Gloss: Match existing.

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 decorative formed metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.
- E. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

- A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with the 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 (0.05-mm) dry film thickness.

3.4 PROTECTION

- A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 061053 - 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. Wood blocking, cants, and nailers.
 - 2. Wood furring and grounds.
 - 3. Wood sleepers.
 - 4. Plywood panels.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.

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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. Provide dressed 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 items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Application: Treat items indicated on Drawings, and the following:
 1. Plywood backing panels at aluminum clad fascia and sunshade panels. Use high temperature fire retardant treatment.

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.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
 1. Mixed southern pine; SPIB.
 2. Spruce-pine-fir; NLGA.
 3. Hem-fir; WCLIB or WWPA.
 4. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 PLYWOOD BACKING PANELS

- A. Backing Panels: DOC PS 1, Exterior, C-C Plugged, fire-retardant treated where indicated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) 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, 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. Power-Driven Fasteners: NES NER-272.

- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

END OF SECTION

SECTION 064116 – 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Extent of plastic laminate casework is indicated on Drawings. Work includes:
 - 1. Plastic laminate finished casework.
 - 2. Cabinet hardware.

1.3 QUALITY ASSURANCE

- A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program, Seventh Edition", Section 400, published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

1.4 SUBMITTALS

- A. Quality Certification: Submit manufacturer's (Fabricator's) certification, stating that the fabricated work complies with quality grades and other requirements indicated.
- B. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
- C. Cabinet hardware: one unit of each type and finish.
- D. Plastic laminate: manufacturer's sample chain.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect casework during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver casework until painting, wetwork, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, casework must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for casework installation areas. Do not install casework until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed casework within a 1.0 percent tolerance of optimum moisture content,

from date of installation through remainder of construction period. The fabricator of casework shall determine optimum moisture content and required temperature and humidity conditions.

- C. Field measurements: Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing casework; show recorded measurements on approved shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND FABRICATION METHODS

- A. Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern, and finish indicated for each application.
 - 1. Colors as selected by owners, all product lines (price points).
- B. Lumber and Panel Materials: Comply with AWI Section 400B requirements for lumber and panel product requirements, unless specific core material is identified herein.
- C. Design and Construction Features: Comply with details shown for profile and construction of casework; and, where not otherwise shown, comply with applicable quality standards.
- D. Shop-Cut Openings: Fabricate casework with shop-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar item openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.
- E. Acrylic Latex Sealant with Silicone: Colored acrylic latex caulk with silicone for sealing joints between casework and building between countertops and backsplashes. Color shall be selected by Architect to match color of laminated plastic surfaces. All products used in this section shall comply with the limits for VOC content as described in Section 01352 paragraph 2.5. Verify the VOC content of the following products:
 - 1. "Form Fill Adhesive Caulk".
 - 2. "ColorRITE Caulking Spectrum".
 - 3. "Color Flex"; Kampel.

2.2 PLASTIC LAMINATE FINISHED CASEWORK

- A. Grade: AWI custom grade.
- B. Cabinet Construction: Flush overlay, conforming to AWI Standard 400-G-10. Provide substrates per AWI Standard 400-G-8, except where noted otherwise. Conform to the following requirements:
 - 1. Cabinet Body Sides, Dividers, Tops, Bottoms, Fixed Shelves and Stretchers: Not less than 3/4" thick. Provide stretchers at top of base cabinet.
 - 2. All adjustable shelves shall be constructed using minimum 3/4" thick 9-ply Luan veneer plywood. Shelves shall have GP-50 type laminated plastic on both faces, and it shall be applied in the same machine direction on both faces. Shelves shall be edge banded with GP-50 type laminated plastic on all 4 sides.

3. Backs: Not less than 1/4" thick.
4. Drawer Fronts: Not less than 3/4" thick.
5. Drawers: Sides, subfronts and backs: Not less than 1/2" thick; bottoms: not less than 1/4" thick. Provide box type construction with front, bottom and back lock shouldered in sides and secured with glue and mechanical fasteners.
6. Doors: Not less than 3/4" thick.
7. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect wall cabinet tops and bottoms and base cabinet bottoms and stretchers to ends and dividers by means of mechanical fasteners. Rabbet tops, bottoms and backs into end panels.
8. Subbase: Not less than 1-1/2" thick, 4-1/4" high, recessed 2-1/2" from cabinet fronts and exposed ends. Cover with vinyl base as scheduled on drawings except where decorative laminate finish is indicated.
9. All base and wall cabinets wider than 36 inches shall have a full height center divider.

C. Semi-Exposed Surfaces: Finish semi-exposed surfaces as follows, unless otherwise indicated.

1. Plastic laminate, CL-20: white in color.

E. Concealed Surfaces: Finish concealed surfaces without plastic laminate with two coats of shellac or clear sanding sealer.

F. Fabricate all exposed edges of casework, including edges of doors and drawers when open, with matching plastic laminate.

G. Wire Management Grommets: Provide where indicated on drawings.

1. Grommet sets shall include a plastic grommet to fit a 2" diameter hole, with a retractable, self-storing slot cover. Color: as selected by owner.
2. Manufacturer: Outwater Plastics Industries, Inc., part #31, or approved equal.

2.3 CABINET HARDWARE

A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of these specifications.

B. Hardware Standards: Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware".

1. Quality Level: Type 2 (institutional), unless otherwise indicated.
2. Quality Certification: Where available, provide cabinet hardware bearing the BHMA certification label, affixed either to hardware or its packaging, showing compliance with BHMA Cabinet Hardware Standard 201.

C. Cabinet Hardware Schedule: Refer to schedule included as last pages of this section for specific hardware and accessory items required for casework.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- C. Prior to installation of casework, examine shop fabricated work for completion, and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Installer: The installation of all work of this section shall be by the fabricator of the plastic laminate casework.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops).
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor casework to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
- E. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
- G. Sealant: Caulk exposed joints between casework and building with acrylic latex caulk.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective casework wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace casework. Adjust joinery for uniform appearance.
- B. Clean hardware, lubricate and make final adjustments for proper operation.
- C. Clean casework on exposed and semi-exposed surfaces.
- D. Protection: Installer of casework shall advise Contractor of procedures required to protect casework during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

3.4 CABINET HARDWARE SCHEDULE

- A. Finish: Of all hardware shall be US26D.
- B. Manufacturers: Provide products by the following manufacturers or approved equal.

1. Adjustable shelving supports - K & V (Knape & Vogt), #345, for 5 mm hole; nickel-plated steel.
2. Hinges - 35 mm, snap-on type with 120° minimum opening - Grass # 3803 or Blum "Clip 125."
3. Catches - Stanley #SP41, magnetic type (US28).
4. Pulls - Stanley #4483 "wire-pull", 5/16" diameter.
5. Drawer Slides - Knape & Vogt No. 1429 (100 lbs.) telescoping full extension with guided rollers and positive stop; zinc coated cold rolled steel.
6. Locks - Key operated, pin tumbler, dead bolt type. Provide National Locks or Corbin Cabinet Lock, US 26D finish.
7. Drawers:
 - 1 set.....Slides.....1429
 - 1.....Pull.....4483
 - 1.....Lock.....(where indicated on drawings: CCL No. 0738 x strike)
8. Cabinet Doors (single):
(Doors 48" high and over shall carry 3 or more hinges per door)
 - 1 pair.....Hinge.....3803
 - 1.....Catch.....41
 - 1.....Pull.....4483
 - 1.....Lock.....(where indicated on drawings: CCL No. 0737 x strike)
9. Cabinet Doors (pairs):
(Doors 48" high and over shall carry 3 or more hinges per door.)
 - 2 pair.....Hinges.....3803
 - 2.....Catch.....41
 - 2.....Pulls.....4483
 - 1.....Lock.....(where indicated on drawings: CCL No. 0737 x strike)
10. Door and Drawer Locks
 1. Provide where indicated on drawings.
 - 2.. Key base cabinet doors and drawers alike within each Department
 3. Provide two keys per lock.

END OF SECTION

SECTION 071310 - WATERPROOFING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Installer Qualifications: Authorized, approved, or licensed by waterproofing manufacturer.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Pre-applied waterproofing membrane: A composite sheet comprising a HDPE film, a pressure sensitive adhesive, and a weather resistant protective coating.
 - 1. Products:
 - a. Preprufe 200 by Grace Construction Products.
 - b. Equal product by another manufacturer.
- B. Fluid applied waterproofing membrane: A two component, synthetic rubber, cold vulcanized, fluid applied waterproofing membrane that cures to form a resilient, monolithic, fully bonded elastomeric sheet.
 - 1. Products:
 - a. Procor by Grace Construction Products.
 - b. Equal product by another manufacturer.
- C. Auxiliary Materials: Sheet flashing, liquid membrane, substrate patching membrane, mastic, adhesives, tape, and metal termination bars recommended by waterproofing manufacturer.
- D. Protection Course for vertical application: ASTM C 578, Type I, molded-polystyrene insulation board, 1 inch (25 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Clean, prepare, and treat substrates. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

- C. Prepare, fill, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks.
- D. Prepare and treat inside and outside corners.
- E. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.
- F. Install waterproofing according to manufacturer's written instructions.
- G. Inspect membrane before installation of other items and repair any damage according to manufacturer's recommendations.
- H. Install protection course over vertical application waterproofing before starting subsequent construction operations.
- I. Protect waterproofing from damage and wear during construction.

END OF SECTION

SECTION 071900 - WATER REPELLENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 RELATED SECTIONS

A. Division 4 Section – Concrete Masonry Units: Concrete Block walls to receive water repellent.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data sheet for the specified clear water repellent material. Submit description for protection of surrounding areas and non-masonry surfaces, surface preparation, application, and final cleaning.
- B. Applicator Qualifications: Submit qualifications of applicator; stating applicator has a minimum of three (3) years experience using the specified or a similar product. Provide a list of several most recently completed projects, including project name and location, names of owner and architect, and description of products used, substrates, and method of application.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications:

- 1. Experience in the application of the specified or similar products.
- 2. Employs persons trained for the application of the specified or similar products.

1.05 TEST AREA

- A. Before full-scale application, apply water repellent to test area to determine coverage rates, compatibility, effectiveness, and aesthetics.
- B. Apply water repellents to test area in accordance with manufacturer's written instructions. Allow 24 hours or until test area is thoroughly cured before evaluating final appearance and results. Do not begin full-scale application until test area is inspected and approved by the Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the job site in original, tightly sealed, unopened containers, with labels clearly identifying product name and manufacturer. Verify that the product matches that of the original sample applied on the test panel.

B. Storage and Handling: Store containers upright in a cool, dry place. Keep away from sparks and open flame. Store and handle materials in accordance with manufacturer's written instructions.

1.07 PROJECT CONDITIONS

A. Surface Preparation: Contractor or Applicator shall be responsible for providing a clean, dry substrate free from oil, dirt, grease, efflorescence, form release agents or any other coating, which may inhibit penetration and adhesion of water repellent. This requirement applies to new construction, renovation or remedial projects. Substrate must be completely dry prior to applying product.

B. Environmental Requirements:

1. Do not apply material if the substrate is wet or contains moisture. Allow substrate to dry for a minimum of 48 hours after rain or 72 hours after power washing.
2. Do not apply material during inclement weather or if precipitation is expected within 2 hours.
3. Do not use spray methods of application under windy conditions.

C. Protection:

1. Special precautions should be taken to avoid fumes from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and covered.
2. Protect shrubs, metal, glass, vehicles, and other building hardware from overspray.

1.09 WARRANTY

A. 10 Year Vertical Warranty:

1. Prior to commencement of application of product, submit Sections 1 and 2 of manufacturer's Warranty Application Form to manufacturer for pre-approval of warranty.
2. After completion of the project, submit Section 3 to manufacturer for final approval. Manufacturer will provide written warranty to building owner upon approval.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design: PWS-15 Super Strength as manufactured by Professional Products of Kansas, Inc.
- B. The water sealant product listed above is selected as a standard of quality. Application procedure and coverage rates must be in conformance with results of testing samples submitted, recommendation of application rates suggested, approved manufacturers standards and as a minimum, that specified herein.
- C. Proposed substitute products must be equal in terms of chemical composition and performance standards. Products must be a penetrating, permanent waterproofing treatment using a silicone rubber base and not contain any paraffin waxes, urethanes or polysiloxanes. Silane and siloxane based products will not be considered due to of their lack of elastomeric properties.

2.02 WATER REPELLENTS

A. Penetrating silicone rubber water repellent for use on vertical porous concrete, porous brick, sandstone, limestone, wood, and stucco. Penetrates without altering the natural appearance of the substrate (In some cases, the substrate may be slightly darkened or enhanced). Will not form a surface film or gloss. Inorganic, it is not affected by UV rays, salts, acid rain, etc. Breathable, it allows moisture vapor to escape while preventing liquid penetration. Flexible, it bridges hairline cracks and allows for building movement. Inhibits mold and mildew.

1. Product: PWS-15 Super Strength
2. Form: Liquid
3. Color: Clear
4. Active Substance: RTV Silicone Rubber
5. Percent Active Material: 15%
6. Flash Point: 105°

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify the following:
1. The required joint sealants have been installed.
 2. New masonry and mortar has cured a minimum of 28 days.
 3. Surface to be treated is clean, dry, and contains no moisture.
 4. Environmental conditions are appropriate for application.

3.02 PROTECTION

- A. Protect surrounding areas, glass, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with water repellents.
- B. Special precautions should be taken to prohibit fumes from entering the building being treated. Ventilation systems and fresh air intakes should be turned off and covered.

3.03 SURFACE PREPARATION

- A. Clean all dirt, oil, grease, mold, mildew, efflorescence, form release agents, curing compounds, or any other coating or material from surfaces that interfere with penetration, performance, adhesion, or aesthetics of water repellents. Rinse thoroughly, to remove cleaner residues. Allow surfaces to dry completely before application of water repellents. Extremely dense concrete surfaces should be prepared using soda, sand, or shot blasting to facilitate penetration.
- B. Repair, patch, and fill all cracks, voids, defects, and damaged areas in surface as approved by the Architect. Allow repair materials to cure completely before application of water repellents.
- C. Seal all open joints.

D. Allow new masonry and concrete construction and repointed surfaces to cure for a minimum of 28 days before application of water repellents.

3.04 APPLICATION

A. Apply water repellents to substrate in accordance with manufacturer's written instructions, environmental regulations, and application procedures determined from the test panel results and as approved by the Architect.

B. Apply to clean, dry, cured, and properly prepared surfaces approved by Architect.

C. Apply material as shipped by the manufacturer. Do not dilute.

D. Do not apply to below-grade surfaces.

E. Do not apply to painted surfaces.

F. Do not apply to compensate for structural or material defects in substrates.

G. Do not apply to substrates such as asphalt or polystyrene, which may be affected by the solvent carrier.

H. Apply material using a high-volume, low pressure, pump-up sprayer (between 40-50 psi), with a fan tip and solvent resistant fittings. Roller, or brush of natural bristle or foam may be used in areas where spray application is not appropriate. Do not use Airless spray equipment.

1. Vertical Applications: Apply in a flood coat, from top to bottom, being sure to obtain a 4 to 6 inch rundown of product from the point where the spray makes contact with the surface. Work all the way down the building covering the rundown as you go. Avoid excessive overlapping.

3.05 FIELD QUALITY CONTROL

A. Inspection: Inspect the water repellent work with the Contractor, Architect, applicator, and Professional Products of Kansas representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably protected by the water repellents.

3.06 FINAL CLEANING

A. Upon completion of all work covered in a specification, the Contractor shall remove all equipment, material and debris, leaving the area in an undamaged and acceptable condition. Dispose of water repellent containers according to state and local environmental regulations.

B. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to water repellents.

END OF SECTION

SECTION 072100 - BUILDING INSULATION

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 the following:
 - 1. Concealed and exposed building insulation.
- B. Related Sections include the following:
 - 1. Division 7 Section - Modified Bituminous Roofing for roofing insulation
 - 2. Division 7 Section - Foamed-in-Place Masonry Wall Insulation for insulation at CMU cores.
 - 3. Division 9 – Gypsum Board Assemblies for sound attenuation insulation
 - 4. Division 13 Section – Metal Building Systems Supplemental for wall and roof insulation at pre-engineered metal building.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by 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 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Wall and plenum insulation: Semi-rigid unfaced glassl-fiber board insulation: thermal insulation complying with ASTM C612 Type IA and 1B. Flame-Spread Index: 25 or less (ASTM E 84) and smoke developed 25 or less (ASTM E 84). Provide in 3 inch thickness unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with

adhesive or use mechanical anchorage to provide permanent placement and support of units.

- B. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072119 - FOAMED-IN-PLACE MASONRY WALL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section. Include all new exterior concrete block walls unless indicated otherwise. This product is used in the bid alternate where an exterior wall of cement plaster on CMU is used at locations shown on the drawings.
- B. Applications of insulation specified in this section include the following:
 - 1. Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.2 SUBMITTALS

- A. Product and technical data sheets as provided by the manufacturer.
- B. Certified Test Reports: With product data, upon request submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CFR 1910 1200.

1.3 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide insulation components produced by one approved manufacturer..
- B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced contract installer that is trained and authorized by the insulation manufacturer.
- C. Warranty: Provide a one year product and installation warranty issued by both the manufacturer and installer.
- D. Thermal Scans: Upon request, the installer shall provide thermal scans of the insulated walls. All uninsulated areas shall be insulated at no added cost to the owner.
- E. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics conform to the requirements of the prevailing edition of the Florida Building Code.

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Potential Heat:	NFPA 259

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:
 - 1. "Core Foam Masonry Foam Insulation®" CfiFOAM, Inc., P.O. Box 10939, Knoxville, TN 37939. (865) 588-4465.
 - 2. "Core-Fill 500™"; Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28603, (800) 627-1687
 - 3. Or equal as approved by the Architect.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls. The product shall be formaldehyde free.
 - 1. Fire-Resistance Ratings: Masonry foam insulation shall be demonstrated not to diminish the fire-resistance rating of concrete masonry walls when tested per the prevailing ASTM E-119 protocol.
 - 2. Surface Burning Characteristics: Masonry foam insulation shall demonstrate Class A surface burning characteristics when tested per the prevailing ASTM E-84 protocol. Flame Spread ≤ 25 , Smoke Developed ≤ 450 .
 - 3. Potential Heat: Masonry foam insulation shall demonstrate ≤ 8000 Btu/lb when tested per the prevailing NFPA 259 protocol.
 - 4. Thermal Values: R-Value of 4.4/inch @ 75 \leq F mean when tested per the prevailing ASTM C-177 or ASTM C-518 protocols.
 - 5. Sound Transmission Class ("STC"): STC ≥ 53 dB or more for 8" CMU wall as measured by the prevailing ASTM E 90 protocol.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Application Assemblies:
 - 1. Block Walls: Concrete masonry units, width as indicated on the drawings.

3.2 INSTALLATION OF FOAMED-IN-PLACE INSULATION

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Prior to commencing installation, the installer shall review architectural and structural construction drawings and note where intermediate horizontal tie beams (cast in place or as courses of concrete masonry units with concrete grout filled knock-out blocks) are located. The installer shall modify the procedure below where necessary to fill all open cells.
- C. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled vertical columns of core-cells at appropriate horizontal intervals beginning at approximately four (4) feet above finished floor level. Repeat this procedure at appropriate elevations of up to twenty (20) feet above the first horizontal row of holes until core-cells are completely filled. Patch drilled holes with mortar and score to resemble existing surface.

END OF SECTION

SECTION 075520 - SBS-MODIFIED BITUMINOUS SHEET ROOFING

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 the following:
 - 1. Two-ply modified bituminous membrane roofing with mineral granule surfacing.
 - 2. Modified bituminous sheet flashing with metal foil surfacing.
 - 3. Roof insulation.
 - 4. Roofing asphalt.
 - 5. Temporary roofing.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for treated wood nailers, curbs, and wood cants.
 - 2. Division 7 Section "Flashing and Sheet Metal" for metal counter flashings, edge metal, scuppers, copings, etc.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.
- B. Thermal Resistance (R-value) is the reciprocal of thermal conductance (C-value) which is the rate of heat flow through a material of the thickness indicated. Thermal resistance (R-value) is expressed by the temperature difference in degrees F (Kelvins) between the two exposed faces required to cause 1 Btu to flow through 1 sq. ft. (1 watt to flow through 1 sq. m) per hour at the mean temperature indicated.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.
- B. Roofing System Design: Tested by a qualified testing agency to resist the following uplift pressures:
 - 1. Corner Uplift Pressure: As indicated on project structural drawings.
 - 2. Perimeter Uplift Pressure: As indicated on project structural drawings.
 - 3. Field-of-Roof Uplift Pressure: As indicated on project structural drawings.

- C. UL Listing: Provide modified bituminous sheet roofing system and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class B external fire exposure.
- D. FM Listing: Provide modified bitumen sheet roofing system and component materials that have been evaluated by Factory Mutual System for fire spread, wind uplift, and hail damage and that are listed in "Factory Mutual Approval Guide" for Class I construction.
 - 1. Roofing system shall be installed in compliance with Factory Mutual requirements for an FM 1-90 wind uplift classification.
- E. Insulation Fire-Performance Characteristics: Provide insulation materials that are identical to materials whose fire-performance characteristics have been determined for the assemblies of which the insulation materials are a part, per test method listed below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Surface Burning Characteristics: ASTM E 84.
 - 2. Fire Resistance Ratings: ASTM E 119.

1.5 SUBMITTALS

- A. Product data for each type of product specified. Include data substantiating that materials comply with requirements.
 - 1. For asphalt bitumen, provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP), and equiviscous temperature (EVT).
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:
 - 1. Base flashings, cants, and membrane terminations.
 - 2. Tapered insulation, including slopes and fastening patterns including corner areas and perimeters.
 - 3. Crickets, saddles, and tapered edge strips, including slopes.
- C. Approvals:
 - 1. Current Florida Product Approval for roof system submitted showing compliance with wind uplift requirements.
- D. Installer Certification: Submit written certification from manufacturer of modified bituminous sheet roofing system certifying that Installer is approved by manufacturer to install specified roofing system. Provide copy of certification to Architect before award of roofing work.
- E. Submit calculations certifying that the base layer and tapered layer insulation system will provide a minimum average R value of R30 for the composite roof-ceiling assembly. R values shall be based upon aged materials.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain primary products, including each type of roofing sheet, bitumen, and membrane flashings, from a single manufacturer. Provide secondary products as recommended by manufacturer of primary products for use with roofing system specified.

- B. **Installer Qualifications:** Engage an experienced Installer (Roofer) who is certified by modified bituminous sheet roofing system manufacturer as qualified to install manufacturer's roofing materials.
1. **Installer's Field Supervision:** Require Installer to maintain a full-time supervisor/foreman on job site during times that modified bituminous sheet roofing work is in progress and who is experienced in installation of roofing systems similar to type and scope required for this Project.
- C. **Preapplication Conference:** Before installing roofing system, conduct conference at Project site. Notify participants at least 5 working days before conference.
1. Meet with Owner; Architect; Owner's insurer, roofing Installer; roofing system manufacturer's representative; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members. Review methods and procedures related to demolition of existing roofing and insulation system, including removal and disposal of asbestos-containing bituminous roofing materials. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
 4. Review loading limitations of deck during and after roofing.
 5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
 7. Review temporary protection requirements for roofing system during and after installation.
 8. Review roof observation and repair procedures after roofing installation.
 9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.
- D. **Submit certification by the manufacturer of the system materials used that these Specifications and the Drawing Details are acceptable to them for the deck and surfacing to which they are to be applied.**
1. If details for any manufacturer's systems proposed in the Contract Documents are not acceptable to the manufacturer, submit corresponding details proposed for the particular application, together with the manufacturer's reasons for not accepting the conditions depicted in the Specifications or Drawings. No alternate details will be considered without evidence of valid objections on the part of the manufacturer to the contract requirements.
 2. No deviation is to be made from this Specification without prior written approval by the manufacturer; submit such approval to the Architect.
- E. **Inspection:** Prior to, during installation and at completion of the installation, an inspection shall be made by a representative of the manufacturer in order to ascertain that the roofing system has been installed according to their published specifications, standards and details.
1. Warranty will be issued upon approval of the installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle roofing sheets in a dry, well-ventilated, weathertight place to ensure no possibility of significant moisture pickup. Store rolls of felt and other sheet materials on end on pallets or other raised surface.
- B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather or other moisture sources.
- C. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.
- D. Protect roofing insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1.8 PROJECT CONDITIONS

- A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit unit of Work to be installed in accordance with manufacturers' recommendations and warranty requirements.
- B. Temporary Roofing: When adverse job or weather conditions prevent permanent roofing system from being installed according to requirements and Contractor determines that roofing cannot be delayed because of need for job progress or protection of other work, install temporary roofing. Engage roofing Installer to provide temporary roofing and to remove it prior to proceeding with permanent roofing work.

ROOFING MEMBRANE WARRANTY AND MEMBRANE FLASHING ENDORSEMENT

- A. Furnish written warranties with membrane flashing endorsements which shall extend From the Date of Substantial Completion as certified by the Architect for a period set forth below, and which shall cover any and all necessary labor and material for repair or replacement work required to keep and maintain the roofing membrane and membrane flashing work in a watertight and first-class condition, at no additional cost to the Owner. Warranties and endorsements shall not be pro-rated by design or inflation. These warranties and endorsements shall be limited to cover ordinary wear and tear caused by the elements (including windstorms producing up to FM 1-90 wind uplift forces) and to defects due to faulty materials or workmanship.

These warranties shall be furnished independently by each of the following:

1. For a period of two (2) years after the Date of Substantial Completion of the project, by:
 - a. The roofing installer.
2. For a period of twenty (20) years after the Date of Substantial Completion of the project (20 year no-dollar-limit warranty), by:
 - a. The manufacturer of the roofing products.
3. For a period of one (1) year after the Date of Substantial Completion of the Project,

by:

a. The Contractor.

- B. Damages to the building or to its contents due to defect in workmanship after the Date of Substantial Completion and for a period of two (2) years thereafter shall be severally borne by the responsible firm(s) (Contractor, Roofing Installer), excepting the manufacturer.
- C. No lesser terms of the "standard" warranties or guarantees by the manufacturer shall apply to this Contract if less stringent than the requirements of this Section. The requirements set forth herein shall be set forth in writing in the signed warranties provided to the Owner under this Contract.

1.9 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 membrane roofing, base flashings, roof insulation, fasteners, roofing accessories, roof pavers, 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, signed by Installer, covering the Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOF INSULATION

- A. General
 - 1. A two-layer insulation system is required at air-conditioned spaces. The system shall consist of polyisocyanurate board as the base layer and tapered perlite board as the top layer. Provide flat top layer unless otherwise indicated on Drawings.
 - a. Over corrugated steel decks and plywood decks, screw attach base layer to deck and mop top layer to base layer.
 - b. Over corrugated steel decks at walkway canopies use tapered boards.
 - 2. Perlite Board Insulation: Rigid, noncombustible, perlite-fiber boards of thicknesses indicated, with k-value of 0.36 at 75 deg F , integrally skinned surfaces, complying with ASTM C 728. Provide manufacturer's standard sizes.
 - a. Provide tapered boards to maintain constant slope in direction indicated on drawings. Minimum finished slope: 1/4" per foot including any slope in roof structure, unless otherwise noted on drawings. Maintain this finished slope on all crickets.
 - 3. Polyisocyanurate-foam board Insulation: rigid boards of minimum 2.0 pcf density polyisocyanurate-based foam core, bonded to Type II roofing felt facer sheets,

complying with ASTM C 1289. Provide in thickness indicated, with minimum k-value of 0.17 when tested according to ASTM C 518 after insulation is conditioned per RIC/TIMA 281-1 Conditioning Procedure. Provide in manufacturer's standard sizes.

B. Mechanical Fastening System for Roof Insulation:

1. Provide an FM-approved highly corrosion-resistant screw-and-plate mechanical fastening system for attachment of base layer of rigid board roof insulation to corrugated steel roof decking substrates and to plywood substrates, as acceptable to roof membrane system manufacturer, and as specified herein.
2. Self-drilling type screw fasteners shall be designed to provide maximum pullout resistance with minimum driving torque, and to prevent fastener backout during installation. Provide stainless steel, zinc alloy or acceptable coated fastener in combination with metal or thermoplastic plate for entire assembly, and as standard for selected fastening system; zinc-plated fasteners are not acceptable.

2.2 MODIFIED BITUMINOUS SHEET ROOFING SYSTEM

A. Insulated-Deck, Modified Bitumen membrane/Fully Adhered (IMBF):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Firestone.
 - b. GAF Materials Corporation.
 - d. Johns Manville.
 - f. Siplast, Inc.
 - g. Soprema, Inc.
2. Roof System
 - a. For all applications, provide a 2-ply SBS modified bitumen elastomeric roofing system for mop-down installation over rigid insulation. The materials of the membrane roofing shall conform to the following requirements:
 1. First Ply-smooth SBS fiberglass or polyester reinforced, 118 mils (average) thick membrane, weight 80 lbs. per 100 sq. ft. (average).
 2. Cap Ply - SBS fiberglass or polyester reinforced, 120 mils (average) thickness with white granular surface. Weight 90 lbs. per 100 sq. ft. (average).
 3. Flashings - SBS fiberglass or polyester reinforced, as recommended by the manufacturer for the system installed.
 - b. The Contractor shall immediately, upon application of roofing membrane cap plies, install loose white granules into exposed hot mopped black asphalt. Professional workmanship shall be required to keep the roof's white cap sheet and flashing looking aesthetically pleasing upon completion of Project. Voids, air pockets, ridges, and wrinkles are not acceptable as a finished product.

A. Insulated-Deck, Modified Bitumen membrane/Fully Adhered (IMBF):

1. General:

- a. Performance: provide roofing materials recognized to be of generic type and manufacturer indicated and tested to show compliance with indicated

performances.

2. Membrane Manufacturer:

a. General: Only the modified bitumen roofing manufacturers listed herein may provide the products specified.

b. For all applications, provide a 2-ply SBS modified bitumen elastomeric roofing system for mop-down installation over rigid insulation. The materials of the membrane roofing shall conform to the following requirements:

1. First Ply-smooth SBS fiberglass or polyester reinforced, 118 mils (average) thick membrane, weight 80 lbs. per 100 sq. ft. (average).

2. Cap Ply - SBS fiberglass or polyester reinforced, 120 mils (average) thickness with white granular surface. Weight 90 lbs. per 100 sq. ft. (average).

3. Flashings - SBS fiberglass or polyester reinforced, 98 mils (minimum) thickness, faced with embossed aluminum foil, weight 90 lbs. per 100 sq. ft. (minimum).

c. Modified Bitumen Roofing Manufacturers: Subject to conformance to specifications including warranty requirements, provide one of the following systems:

1. Siplast Paradiene 20/30 FR - Paradiene 20 EG Base and Paradiene 30 FR Cap, with Veral aluminum surfaced flashing system applied over Paradiene 20 EG flashing base ply.

2. Soprema 2144 FR - Sopralene 180 Sanded Base and Sopralene 180 FR Granules Cap, with Sopralast 50 TV ALU aluminum surfaced flashing system applied over Sopralene FLAM 180 flashing base ply.

3. Approved equivalent.

d. The Contractor shall immediately, upon application of roofing membrane cap plies, install loose white granules into exposed hot mopped black asphalt. Professional workmanship shall be required to keep the roof's white cap sheet and flashing looking aesthetically pleasing upon completion of Project. Voids, air pockets, ridges, and wrinkles are not acceptable as a finished product.

3. Roofing Bitumens:

a. Roofing asphalt, complying with ASTM D312, Type IV.

4. Related Materials:

a. Lead flashing for roof drains shall be minimum 4 lb. sheet of common desilverized pig lead extending a minimum of 8 in. beyond drain body.

b. Pipes or vents shall be jacketed. Jackets shall be formed from minimum 4 lb. Lead sheet with minimum 4 in. flanges and extend into the vent a minimum of 1-1/2 in.

2.3 MISCELLANEOUS MATERIALS

- A. Wood Members: Comply with requirements of Division 6 Section "Rough Carpentry" for wood members indicated as roofing system work.
- B. Cants: Perlite board, ASTM C 728.
- C. Tapered Edge Strips: Rigid perlite board, ASTM C 728.
- D. Walkway Protection Boards: Mineral-surfaced ½" thick bituminous composition panels, or 5/16" thick chopped rubber composition panels, manufactured specifically for hot bituminous application on modified bitumen sheet roofing as a protection course for foot traffic. Subject to compliance with requirements, provide one of the following:
 - 1. Carey-Tread, Celotex Corp.
 - 2. White Walk, W. R. Meadows, Inc.
 - 3. Trafbloc, Siplast.
- E. Substrate Joint Tape: 6 or 8 inch (150 or 200 mm) wide, coated, glass-fiber joint tape.
- F. Mastic Sealant: Polyisobutylene (plain or bituminous modified), nonhardening, nonmigrating, nonskinning, and nondrying.
- G. Asphalt Primer: ASTM D41.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. With installer present, examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
 - 1. Verify that flatness and fastening of metal roof decks comply with installation tolerances specified in Division 5 Section "Steel Deck."
 - 2. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
 - 3. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
 - 4. Test concrete substrate for excessive moisture by pouring 1 pint (0.5 L) of hot bitumen at 400 deg F (204 deg C) or EVT on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if test sample foams or can be easily and cleanly stripped after cooling--then substrate is too wet.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."

- B. Start installation of modified bituminous membrane roofing in presence of roofing system manufacturer's technical personnel.
- C. Cooperate with inspection and test agencies engaged or required to perform services in connection with installing modified bitumen sheet roofing system.
- D. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of modified bituminous sheet roofing system work.
- E. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.
- F. Asphalt Bitumen Heating: Heat and apply bitumen according to EVT Method as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 25 deg F (14 deg C), at point of application) more than 1 hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either by information from manufacturer or by suitable tests. Do not exceed recommended temperature limits during bitumen heating. Do not heat bitumen to a temperature higher than 25 deg F (14 deg C) below flash point. Discard bitumen that has been held at temperature exceeding finished blowing temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.
- G. Bitumen Mopping Weights: For interply mopping, apply bitumen at the rate of 25 lb of asphalt per roof square (plus or minus 25 percent on a total-job average basis).
- H. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. Where mopping is applied directly to substrate, tape substrate joints or, where steep asphalt is used, hold asphalt back 2 inches from both sides of the joint.
- I. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and any insulation. Provide temporary covering of two plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work.

3.3 INSTALLING INSULATION

- A. General: Comply with insulation manufacturer's printed instructions and current recommendations for the storage, handling, installation, and anchorage of insulation to substrate. If printed instruction are not available or do not apply to Project conditions, consult insulation manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Cut and fit tightly around obstructions, and fill voids with insulation. Form crickets, saddles, and tapered areas as shown and as required for proper drainage of the roofing membrane.

- C. Factory tapered boards shall have all dust and loose particles removed from cut surfaces before installation. Tapered boards damaged during placement shall be immediately replaced with undamaged units.
- D. Field tapering: Field tapering shall be limited to minimal tapering required to relieve factory tapered layouts from ridging offsets and other isolated conditions which will inhibit the movement of water directly to drains or otherwise cause a non-uniform surface for the application of the roofing membrane. Use methods of field tapering as recommended by insulation manufacturer to result in uniform surfaces.
 - 1. Slopes indicated on Drawings shall be properly maintained in the field, with constant tapers from high points and ridge lines to valleys and roof drains as indicated. Provide additional tapered insulation as required by field conditions to maintain slopes and eliminate flat spots or depressions that could cause ponding water. Field verify that proper slopes have been achieved without flat spots or depressions prior to commencement of roof membrane installation, using string lines.
 - 2. All valleys shall be field mitered.
- E. For installation directly over corrugated steel roof decks, secure base layer insulation boards to substrate using mechanical fasteners specifically designed and sized for attachment of specified insulation boards to substrate type shown. Fasten insulation over entire area of roofing substrates with specified fasteners; number, spacing, pattern, and locations of fasteners, including corner areas and perimeters, to comply with specified Factory Mutual FM 1-90 wind uplift resistance requirements for wind uplift Zone 2. Comply with Factory Mutual Data Sheet 1-28. Run long joints for insulation in continuous straight lines, perpendicular to roof slope with end joints staggered between rows.
 - 1. Install second (top) layer of insulation in a solid mopping of hot Type III asphalt, applied with an EVT of 400 to 450 degrees F. And at a rate of 25 pounds per 100 square feet minimum. Joints of second layer shall be staggered from joints of first layer a minimum of 12 inches in each direction.
- F. For installation over concrete decks, install base layer of insulation in a solid mopping of hot Type III asphalt, applied with an EVT of 400 to 450 degrees F. And at a rate of 25 pounds per 100 square feet minimum. Run long joints for insulation in continuous straight line, perpendicular to roof slope, with end joints staggered between rows. "Walk boards in" to assure thorough bond with asphalt and concrete deck.
 - 1. Before installing insulation, prime any exposed concrete deck with .75 gallons of asphaltic primer per square and allow primer to dry.
 - 2. Install second (top) layer of insulation in a solid mopping of hot Type IV asphalt, applied with an EVT of 400 to 450 degrees F. and at a rate of 25 pounds per 100 square feet minimum. Joints of second layer shall be staggered from joints of first layer a minimum of 12 inches in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.

3.4 ROOF MEMBRANE INSTALLATION

- A. Shingling Plies: Install membrane with ply sheets shingled uniformly to achieve required number of membrane plies throughout. Shingle in proper direction to shed water on each large area of roofing, where slope is significant (over ½ inch per foot (1:25)).
- B. Cant Strips/Tapered Edge Strips: Install preformed 45-degree cant strips at junctures of modified bituminous sheet roofing system membrane with vertical surface. Provide preformed, tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- C. Base Sheet: Install one lapped course of base sheet. Mop to substrate with hot roofing asphalt, applied at rate required by roofing system manufacturer.
- D. Cap sheet: Promptly after completing base sheet (same day where possible), apply one lapped course of cap sheet of type indicated. Set cap sheet in uniform mopping of same hot roofing asphalt used in plysheet course, applied at rate required by roofing system manufacturer. Lap edges 4 inches and sheet ends 6 inches minimum.
- E. All laps and seams must be tight and properly sealed.
 - 1. Seal natural voids (the area just inside the lap line of top sheet).
 - 2. Fully adhere the lap surface and bead to form a smooth transition.
 - 3. Bond and seal bridging seams.
 - 4. Asphalt flow at side and head laps must be 3/8 in. or greater. Apply mineral granules at the asphalt overflow matching size, color, and texture of granules of cap sheet.
 - 5. Extend all plies of roofing membranes plies continuous and uncut beneath scuppers. Mop strip plies into scupper.

3.5 MEMBRANE FLASHING AND STRIPPING

- A. Install modified bituminous flashing at cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install one ply of flashing sheet material by mopping substrate and back of flashing sheet with Type III asphalt and embedding flashing solidly against substrate. Extend flashing a minimum of 6 inches (150 mm) onto modified bituminous sheet roofing.
- B. Install modified bituminous stripping where metal flanges are set on roofing. Install one ply of modified bituminous stripping in a continuous mopping of Type III asphalt and extend stripping a minimum of 6 inches (150 mm) out onto the roof membrane.
- C. Roof Drains: Set 30 x 30 inch (750 x 750 mm) lead flashing sheet in bed of roofing cement on completed modified bituminous roofing sheet. Cover lead sheet with modified bituminous stripping, with stripping extending a minimum of 4 inches (100 mm) beyond edge of lead flashing onto roof membrane. Clamp roof membrane, lead flashing, and stripping into roof drain clamping ring.
- D. Counter-Flashings: Counter-flashings, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other Sections.

3.6 ROOF WALKWAYS

- A. Composition Board Walkways: Provide walkway protection boards at locations shown, using units of size shown or, if size not shown, using units of manufacturer's standard size. Set units in additional pour coat of hot bitumen.

3.7 PROTECTING ROOFING

- A. Protect roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, inspect roofing and prepare a written report, with copies to Architect and Owner, describing nature and extent of deterioration or damage found.
- B. Repair or replace (as required) deteriorated or defective work found at time of above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION

SECTION 076200 - 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 fascia and coping sheet metal fabrications.
- B. Related Requirements:
 - 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, blocking, and plywood substrate.
 - 2. Division 10 Section "Sunshades" for coordination of panel finishes.
 - 3. Division 13 Section "Supplement to Metal Building Systems" for sheet metal flashing and trim integral with metal roof and wall panels.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with 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 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, expansion-joint locations, 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 for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.

7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of special conditions.
9. Include details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish.

1. Aluminum Samples: Samples to show polished aluminum finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.6 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.

- 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. Build mockup of typical roof fascia and coping trim approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
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.

1.7 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. 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 F (67 deg C), ambient; 180 deg F (100 deg C), 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. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. As-Milled Finish: Mill, One-side bright mill, Standard one-side bright, or Standard two-side bright as recommended by fabricator to result in best match to existing adjacent material after final polishing.
 - a. Final Finish: As-Milled then machine buffed and polished to match sheen of sunshades and fascia trim on existing parts of the building.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
 - e. Metal-Fab Manufacturing, LLC; MetShield.
 - f. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
 - g. Polyguard Products, Inc.; Deck Guard HT.
 - h. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
 - i. SDP Advanced Polymer Products Inc; Palisade SA-HT.
 - 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C) or higher.

3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C) or lower.

- B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, 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.
- B. 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.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 2. Fasteners for Aluminum Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide, or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. 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. 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.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. 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.
 4. 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 (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Joints as indicated on the Project Drawings.
- 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 from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- G. Do not use graphite pencils to mark metal surfaces.

2.6 FASCIA AND COPING SHEET METAL FABRICATIONS

- A. Fascia and Coping: Fabricate in lengths indicated on the drawings, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as fascia and copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight.
1. Coping Profile: As indicated on the drawings.
 2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, exposed cover plate to match existing adjacent construction.
 3. Fabricate from the Following Materials:
 - a. Aluminum: 0.080 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.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- 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 (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 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. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. 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.
 3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.
 6. Do not use graphite pencils to mark metal surfaces.
- 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. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- D. 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.

- E. 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 (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), 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 (4 deg C).
- F. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 FASCIA AND COPING INSTALLATION

- A. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at maximum 12-inch centers.
 - 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at maximum 12-inch centers.

3.5 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

SECTION 078413 - FIRESTOPPING AND SMOKESEALING

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 firestopping and smoke sealing for the following:
 - 1. At the head of fire-resistance-rated and smoke-resistant walls abutting the underside of structural roof decks, and the perimeter of such walls at abutting construction.
 - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 4. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 9 Section "Gypsum Board Assemblies" for fire-rated deflection track.
 - 2. Division 22 and 23 Sections "Plumbing" and "Mechanical."
 - 3. Division 26 Sections "Electrical."

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
 - 1. Firestopping and smoke sealing shall comply with the requirements of the Florida Building Code, Sixth Edition (2017) supplement, and NFPA 101.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- D. For firestopping exposed to moisture and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
 1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Shop drawings detailing condition-specific materials, installation methods, and relationships to adjoining construction for each through-penetration firestop and smoke seal system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop and smoke seal configuration for construction and penetrating items.
 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.
- D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the

penetrating items in the test assembly. Provide rated systems complying with the following requirements:

- a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
- 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- D. Provide firestopping products: shall not contain asbestos. Products shall be certified by manufacturer as "asbestos free."

1.6 COORDINATION

- A. Coordinate with plumbing, mechanical, electrical, and other trades to ensure that pipe, conduit, cable, and other items which penetrate fire-rated or smoke barrier construction have been permanently installed, and sleeved when necessary, prior to installation of firestops and smoke seals.
- B. Schedule and sequence the work to assure that partitions and other construction which would conceal or enclose penetrations are not erected prior to the installation of firestops and smoke seals.

1.7 WARRANTY AND CERTIFICATION

- A. Contractor shall provide the following notarized affidavit jointly signed by corporate officers, with titles noted, of both the Contractor and material applicator:

"We the undersigned certify that firestops and smoke seals have been installed in accordance with Contract Document requirements and manufacturer's

instructions, and that materials used meet firestopping and smoke sealing requirements of the Contract Documents”.

- B. Manufacturer shall provide the following certification, executed by the appropriate person, with title and department noted:

“Products provided by (manufacturer) for the (name of project) are composed of the same ingredients and formulation or are of the same components and identical construction as products that have been tested by (the testing agency) for various fire resistive and other performance ratings, and when properly applied or installed in accordance with (manufacturer) instructions will perform in a manner consistent with results obtained in the tests conducted by (the testing agency)”.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.

- 4. Collars.
- 5. Steel sleeves.

- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- B. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- C. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.
- G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant.
- J. Acoustical Sealant (for use only in assemblies indicated to be smoke resistant; not for firesafing of assemblies with fire resistance ratings): ASTM C919 and ASTM C834, water-based, highly elastic caulking; non-bleeding and staining, permanently flexible. Flame spread 0, smoke developed 0.
- K. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Endothermic, Latex Sealant:
 - a. Fyre-Sil, Tremco Inc.
 - 2. Endothermic, Latex Compounds:

- a. Flame-Safe FS900/FST900 Series, Flame Safe
3. Intumescent Sealant:
- a. Metacaulk 1000, The RectorSeal Corporation.
 - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
 - c. Bio Fireshield 500+, The RectorSeal Corporation.
 - d. Bio Fireshield Bio-BF150, The RectorSeal Corporation.
 - e. TREMstop IA, Tremco, Inc.
4. Intumescent Putty:
- a. Pensil 500 Intumescent Putty, General Electric Co.
 - b. Flame-Safe FSP1000 Putty, Metacaulk
 - c. Fire Barrier Moldable Putty, 3M Fire Protection Products.
 - d. Bio Fireshield Fire Rated Putty, The RectorSeal Corporation.
 - e. TREMstop FP, Tremco, Inc.
5. Intumescent Wrap Strips:
- a. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
 - b. Bio Fireshield Wrap Strip, The RectorSeal Corporation.
 - c. TREMstop WS, Tremco, Inc.
6. Job-Mixed Vinyl Compound:
- a. USG Firecode Compound, United States Gypsum Co.
7. Mortar:
- a. Bio Fireshield K-2 Firestop Mortar, The RectorSeal Corporation
 - b. Bio Fireshield K-10 Firestop Mortar, The RectorSeal Corporation
 - c. KBS-Mortar Seal, Antec
 - d. TREMstop M, Tremco, Inc.
8. Pillows/Bags:
- a. Bio Fireshield Firestop Pillows, Bio Fireshield
 - b. KBS Sealbags, KBS
 - c. TREMstop PS, Tremco, Inc.
9. Silicone Foams:
- 1. Pensil 200 Foam, Metro Supply Company
10. Silicone Sealants:
- a. Metacaulk 835+, The RectorSeal Corporation.
 - b. Fyre-Sil, Tremco Inc.
 - c. Fyre-Sil S/L, Tremco Inc.
 - d. Bio Fireshield Biotherm 100 & 200, The RectorSeal Corporation

11. Acoustical Sealant

- a. Sheetrock Acoustical Sealant, U.S. Gypsum Company
- b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.3 INSTALLING FIRESTOPS AND SMOKESEALS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration and head-of-wall firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

1. In non-fire-rated, smoke-resistant assemblies, install resilient sealant, either acoustical or fire-resistant type, to completely fill all voids at through-penetrations and head-of-wall intersections to block the passage of smoke. In no event shall drywall compound be used for this purpose.
- C. Install fill materials for through-penetration and head-of-wall firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

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 this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
 - a. Control and expansion joints in unit masonry.
 - b. Control and expansion joints in cement plaster.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Control and expansion joints in ceiling and overhead surfaces.
 - d. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - e. Other joints as indicated.
 - 4. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Firestopping & Smoke sealing" for sealants used in rated assemblies
 - 2. Division 8 Section "Glass and Glazing" for sealants used in glazing.
 - 3. Division 8 Section "Curtain Wall" for sealants used in curtain wall construction
 - 4. Division 13 Section "Metal Building Systems Supplemental" for sealants used in metal wall and roof panel construction

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data from manufacturers for each joint sealant product required.
- D. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- E. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- F. Provide and maintain a file of manufacturer's instructions for each of the products used.
- G. Warranties:
 - 1. Manufacturers Warranty: 5 years
 - 2. Installation Warranty: 5 years

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.
- C. Warranties:
 - 1. Manufacturers Warranty: 5 years
 - 2. Installation Warranty: 5 years

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.
- 1.8 SEQUENCING AND SCHEDULING
- A. Sequence installation of joint sealants in existing interior concrete pavement to occur prior to application of clear concrete sealing compound where indicated or scheduled on drawings.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
- B. Products: Subject to compliance with requirements, provide one of the products specified in color selected by Architect from manufacturer's full color range.
- C. Single Part, Nonsag, Silyl-Terminated Polyether Sealant for use in sealing hollow metal door frames to adjoining wall surfaces, roof flashing and edge metal installations, and general purpose exterior sealing except where silicone is specified:
1. "Sonolastic 150"; BASF Construction Chemicals.
 2. "Novalink"; ChemLink.
- D. Single Part Pourable Urethane Sealant for use in horizontal joints in floor slabs, sidewalks, and concrete pavement. Provide one of the following:
1. "Vulkem 45"; Mameco International, Inc.
 2. "NR-201 Urexpan"; Pecora Corp.
 5. "Sonolastic SL1"; BASF Construction Chemicals.

- E. Medium-Modulus Neutral-Curing Silicone Sealant for use in all exterior masonry control and expansion joints, exterior cement plaster control and expansion joints, and for perimeter sealing of aluminum windows and storefronts.

- 1. 791; Dow Corning (accommodates joint movement of ± 50 percent).
 - a. Apply to masonry and concrete with Dow Corning 1200 Primer.

2.3 LATEX JOINT SEALANTS

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent. Provide at intersections of interior door and window frames and adjoining wall surfaces.

- 1. "AC-20"; Pecora Corp.
- 2. "Sonolac"; Sonneborn Building Products.

2.4 ACOUSTICAL JOINT SEALANT

- A. Acoustical sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

- 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- 2. Install at perimeter joints around all electrical boxes in acoustically-rated walls and all drywall ceilings throughout Music Building 1 and Building 1 Addition, and elsewhere as indicated on drawings.

- B. Manufacturer – Provide one of the following:

- 1. AC-20FTR Acoustical and Insulation Sealant; Pecora Corporation
- 2. Sheetrock Acoustical Sealant; USG Corp.

2.5 MILDEW – RESISTANT SILICONE SEALANT

- A. One-part mildew-resistant interior sealant designed to seal nonporous interior building surfaces including tubs, sinks, lavatories, and urinals at perimeter intersection with finished walls.

- B. Manufacturer – Provide one of the following:

- 1. Dow Corning 786 Mildew-Resistant Silicone Sealant.
- 2. Sanitary SCS1700 Sealant; G.E. Silicones

2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of either material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - 2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf (40 kg/cu. m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with 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 joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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 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 printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with

sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved 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 or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 081110 - STANDARD STEEL 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Standard hollow-metal steel doors.
 - 2. Standard hollow-metal steel frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
 - 3. Division 8 Section "Glazing" for glass in steel doors and sidelights.
 - 4. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

- A. Approval Numbers: Provide State of Florida Product Approval Numbers. Where missile impact resistance is indicated as a requirement on project drawings, provide products which have a Miami-Dade Notice of Acceptance or State or Florida Product Approval for Large Missile Impact.
- B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- C. Shop Drawings:
 - 1. In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:
 - a. Elevations of each door design.
 - b. Details of doors, including vertical and horizontal edge details.

- c. Frame details for each frame type, including dimensioned profiles.
 - d. Details and locations of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.
 - f. Details of anchorages, accessories, joints, and connections.
- D. State of Florida Product Approval must be applicable to actual door and frame sizes indicated on drawings. In addition, the door, frame, and anchorage shall be designed for the applicable minimum wind pressure for components indicated on the structural drawings for this project.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
 - 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate installation of anchorages for standard steel frames. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door Products.
 2. CURRIES Company; an ASSA ABLOY Group Company.
 3. Republic Builders Products Company.
 4. Steelcraft; an Ingersoll-Rand Company.
 5. Amweld International, LLC

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

2.3 STANDARD STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
1. Design: As indicated on Drawings.
 2. Core Construction: Manufacturer's standard polystyrene, polyurethane core, or fire rated mineral fiber core that produces doors complying with ANSI A250.8.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 3. Vertical Edges for Single-Acting Doors: Beveled edge
 - a. Beveled Edge: 1/8 inch in 2 inches.
 4. Top and Bottom Edges: Closed with flush (at top), inverted (at bottom), 0.042-inch- thick end closures or channels of same material as face sheets.

5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior and Interior Doors: Face sheets fabricated from A-60 galvanized steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 16 gage (.053 inch).
- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior and Interior Frames: Fabricated from A-60 galvanized steel sheet.
 1. Fabricate frames with mitered and continuously welded face corners.
 2. Frames for Level 3 A Steel Doors: 16 gage (.053 inch) thick steel sheet.
- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- E. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
- F. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

- G. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FABRICATION

- A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Standard Steel Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
 - 3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. Provide three anchors per jamb.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
 - 1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
 - 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware according to ANSI A250.8.

2.6 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish standard steel door and frames after assembly.
- B. Galvannealed Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

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 standard steel doors and frames.
 - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Standard Steel Frames: Install standard steel frames for doors of size and profile indicated. Comply with SDI 105.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - c. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. 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.
 3. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb 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. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

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 glazed aluminum curtain walls and entrance doors.
- B. Related Requirements:
 - 1. Division 5 Section "Decorative Formed Metal" for interior beam wraps adjacent to curtain wall.
 - 2. Division 10 Section "Sunshades" for sunshades which attach to curtain wall.

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 glazed aluminum curtain walls. 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 vertical-to-horizontal intersection of glazed aluminum curtain walls, 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.
- C. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Submit current State of Florida Product Approval or Miami Dade Notice of Acceptance for curtain wall system to be used which indicates approval for use with the wind loads and impact requirements indicated on the project construction drawings.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, registered in the State of Florida, to design glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:

- a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: Sunshade loads.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft..
- F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
 1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
- H. 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 indicated on project construction drawings.
 1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.
 2. Small-Missile Test: For glazed openings located more than 30 feet (9.1 m) above grade.
- I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 1600 Wall System 1 or comparable product by one of the following:
 - 1. Kawneer North America.
 - 2. Oldcastle, Inc.
 - 3. YKK AP America Inc.
- B. Source Limitations: Obtain all components of curtain wall system, including framing entrances and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Nonthermal.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
 - 4. Finish: Clear anodic finish.
 - 5. Fabrication Method: Field-fabricated stick system.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 350 IR System or comparable product by one of the following:
 - 1. Kawneer North America.

2. Oldcastle, Inc.
 3. YKK AP America Inc.
- B. Source Limitations: Entrances shall be from same manufacturer as curtain wall system.
- C. Impact requirements: Entrances shall comply with same wind load and missile impact requirements as curtain wall system.
- D. Submit current State of Florida Product Approval or Miami Dade Notice of Acceptance for entrance system to be used which indicates approval for use with the wind loads and impact requirements indicated on the project construction drawings.
- E. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 2- to 2-3/8-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: Medium stile; 3-1/2-inch nominal width vertical stile and 6-1/2-inch nominal bottom rail.
 3. Glazing Stops and Gaskets: As recommended by manufacturer.
- F. Furnish hardware with storefront doors. Entrance Door Hardware shall be as specified in Division 8 Section "Door Hardware" and per requirements of this section.
1. Provide a concealed rod exit panic device at each door. Door shall be available with and supplied with an exit device manufactured by one of the following:
 - a. Adams Rite
 - b. Falcon
 - c. Sargent
 - d. Von Duprin
 - e. Yale
 2. For items other than panic devices, if hardware indicated is not consistent with Miami-Dade NOA or Florida Product Approval requirements, provide hardware of equal quality and finish hardware that complies with NOA or Florida Product Approval requirements.

2.5 SUN CONTROL

- A. Sunshade brackets: Curtain wall shall incorporate brackets for support of sunshades. Brackets are to be provided and installed under the work of this curtain wall section. Sunshades are to be per Division 10 Section "Sunshades"
1. Provide two sunshade anchorage brackets at each vertical outrigger anchorage location. Brackets shall be similar to CR Laurence 3250 Series or other product acceptable to curtain wall manufacturer and sunshade fabricator.
 2. Curtain wall manufacturer shall coordinate curtain wall shop drawings with the work provided under specification Section 107110 Sunshades.

2.6 JOINT TRIM

- A. Aluminum Panel Joint Trim: At corners where curtain wall changes direction and at end conditions (if necessary):
 - 1. Material Standard: Aluminum, ASTM B 221, 6063-T6 alloy and temper.
 - 2. Member Wall Thickness: Each framing member shall have a wall thickness sufficient to meet the specified structural requirement with no evidence of "oil canning"
 - 3. Finish shall match adjacent curtain wall members.

2.7 GLAZING

- A. Glazing: Comply with Division 8 Section "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: As recommended by manufacturer and in compliance with Division 8 Section "Glazing."
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less.

2.8 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.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.9 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. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration using one of the following methods:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.11 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

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. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal 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 primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Division 8 Section "Glazing."

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Test Area: Perform tests at areas indicated to be tested as located in project construction drawings, or if no location is indicated, test representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test.
 - 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.
 - a. Perform tests in each test area as directed by Architect. Perform tests, prior to 70 percent completion.
- D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

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 items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Standard Steel Doors and Frames".
 - 2. Division 8 Section "Flush Wood Doors".
 - 3. Division 8 Section "Aluminum Entrances and Storefronts".
- C. Windstorm product approval requirements:
 - 4. Hardware, except keyed cylinders, listed for entrance doors in this section is to indicate quality level and function required at each opening. Specific items listed may be modified as required to maintain windstorm product approvals for exterior openings, but in no case shall materials of lesser quality or different function be acceptable.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.

- g. Door and frame sizes and materials.
 - h. Keying information.
 - D. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.
 - 1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.
 - E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
 - F. For each electrified opening, provide complete wiring diagrams prepared by an authorized factory employee. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval. Wiring diagrams may be submitted after approval of hardware schedule.
- 1.4 QUALITY ASSURANCE
- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
 - B. Supplier Qualifications: A recognized architectural door hardware supplier,, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) as certified by the Door and Hardware Institute who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 - C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
 - D. Disabled Accessibility: Provide hardware that complies with all accessibility codes as they pertain to this project including the Americans with Disabilities Act Accessibility Guidelines and the Florida Accessibility Code for Building Construction.

1.5 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 FINISHES

- A. The designations used in hardware sets and elsewhere indicate hardware finishes are to be industry recognized standard commercial finishes as established by BMHA.

1.	Butts-Exterior.....	630
2.	Butts-Interior.....	652
3.	Locks.....	626
4.	Push, Pull & Kick Plates.....	630
5.	Closers.....	689
6.	Exit Devices.....	630
7.	Door Stops and Miscellaneous.....	630/626
8.	Lock Guards.....	630

2.2 HINGES

- A. Doors 1-3/4" thick minimum 4-1/2" high hinges and shall be as listed in hardware sets.
- B. Each door shall have not less than three hinges. Doors 7'6" and higher shall have four hinges whether specified or not.
- C. Exterior doors over 3'2" wide and/or 7'6" high shall have heavy-weight, four knuckle ball bearing non-ferrous butts.

- D. Exterior doors shall have non-ferrous non-removable pin hinges.
- E. All doors with door closers shall have ball bearing hinges.
- F. Acceptable Manufacturers:
 - 1. McKinney
 - 2. Stanley
 - 3. Hager.

2.3 LOCKSETS

- A. Locksets shall be one of the following manufacturers or approved equal and shall be furnished in the function as listed in the hardware sets. Locks shall be provided in "C" keyway.
- B. Provide 3/4" minimum latch throw for mortise locks, 1/2" throw for cylindrical locks and 1" throw for deadlocks.
- C. All locks shall have cylinders with keyways to match existing master key system.
- D. Acceptable Manufacturers Design Series

1. Yale	AU	4700LN
2. Corbin Russwin	NZD	CL3300
3. Schlage	RHO	ND

2.4 CLOSERS

- A. All closers shall be fully adjustable type with complete spring power adjustment, sizes 1 through 6; field adjustable according to door size and frequency of use.
- B. Adjust all reduced spring power closers on doors to meet disabled accessibility requirements including but not limited to the following:
 - 1. The sweep period of the closer shall be adjusted so that from an open position of 70 degrees, the door will take at least five seconds to move to a point three inches from the latch, measured to the leading edge of the door.
 - 2. Maximum force for pushing or pulling open a door shall be 5 lbf. for interior hinged doors and 8.5 lbf. for exterior hinged doors.
- C. All closers shall have tamper resistant solid forged heavy duty arms. Where closers are indicated to be closer/stop, provide units with a rigid arm assembly and a heavy duty bracket with built-in lug to provide a means of positive stop. For closers where indicated to have spring stop, furnish a heavy duty bracket with spring to allow a cushion prior to door stopping. For closer/holders, provide units with an additional built-in holder designed to hold open against normal wind and traffic conditions. Holder shall be activated manually.
- D. Where closers are indicated to be delayed action (DA and DEL), provide units designed with an adjustable delay that holds the door open before the closing cycle begins.
- E. All closers shall be of one manufacturer, matching design. All closers shall have adjustable backcheck to provide a cushioning effect toward the end of the opening cycle.

- F. Furnish parallel arm brackets for all closers opening out. Where overhead stops and holders are listed, provide proper bracket for clearance. Furnish flush mount transom bracket where no transom bar exists. Furnish top jamb closer and bracket where required by job conditions. Indicate in hardware schedule all doors requiring parallel arm, flush mount or top jamb brackets.

G.	Acceptable Manufacturers	Series
1.	Yale	3500
2.	Corbin Russwin	DC3200
3.	LCN	1460

2.5 EXIT DEVICES

- A. Exit devices shall be one of the following manufacturers or approved equal and shall be furnished in the function as specified in the hardware sets. Provide flush mounted end caps. Plastic end caps will not be accepted. Exit devices shall be stainless steel. Aluminum or powder coated devices are not acceptable. Exit device latch bolts shall be able to withstand 2200lb. pull from the outside.
- B. Except on fire rated doors, equip exit devices with keyed dogging device to hold the push bar down and the latchbolt in a retracted position.
- C. Where exit devices are required on fire rated label doors, provide devices with UL label indicating "Fire Exit Hardware". For doors without fire rating, provided devices listed for "Panic Hardware".
- D. Exit Devices are to matching wherever possible
- | | | |
|----|--------------------------|--------|
| E. | Acceptable Manufacturers | Series |
| 1. | Von Duprin | 99 |

2.6 AUTOMATIC DOOR OPERATORS

- A. Low Energy door operators shall be rack and pinion design. Door closing force shall be adjustable to ensure adequate door control. Door closing speed shall be controlled by independent hydraulic adjustments valves in the sweep and latch range of the closing cycle. Door Operator shall have adjustable hydraulic back check to cushion door speed if opened violently.
- B. Door Operator shall provide conventional door closer opening and closing forces unless power operator motor is activated.
- C. Door Operator shall utilize two on-board push buttons to establish door closed and door closed positions.
- D. Door operator shall be activated by external wall switch. Unit shall delay switches for motor activation, electric lock interfacing, and hold open time. Units shall have relay interfacing with latch retraction exit devices.
- E. Acceptable Manufacturers:
1. Norton 6900 Series

2.6 DOOR STOPS AND HOLDERS

- A. In general, door stops shall be Rockwood 400 series wall stops, either convex or concave with proper anchorage as required. Where two doors interfere with one another, stops shall be Rockwood 455 or 456. Where wall stops are not practical, use dome stops of proper height as required. Where wall or floor stops are not practical, use overhead stops in size and function as required. Other stops are listed in hardware sets as required.
- B. Wall mounted or floor mounted holders shall be as listed in hardware sets and be automatic type with adjustable holding force. Furnish proper strike as required.
- C. Overhead door holders shall be surface or recessed in desired function as listed in hardware sets. Furnish flush mounted transom brackets and intermediate bracket as required.
- D. Acceptable Manufacturers:
 - 1. Rockwood
 - 2. Trimco
 - 3. Sargent
 - 4. Rixson

2.7 THRESHOLDS AND WEATHERSTRIP

- A. Provide thresholds and weatherstrip as listed in hardware sets
- B. Acceptable Manufacturers:
 - 1. Pemko.
 - 2. Zero
 - 3. National Guard.

2.6 SURFACE BOLTS:

- A. Provide manual, self latching or automatic flush heavy duty surface bolts where listed in hardware sets.
- B. Acceptable Manufacturers:
 - 1. Rockwood Mfg.Co.
 - 2. Glynn-Johnson Corp..
 - 3. Trimco

2.7 KEYING

- A. General: Supplier shall meet with Owner to finalize keying requirements to match existing and obtain final instructions in writing.
- B. Submit a proposed keying schedule and written keying explanations for approval based on instructions.

- C. Review the existing keying system with the Owner and provide the type required (master, grand master or great grand master).
- D. Keys: furnish the following:
 - 1. 6 Master keys for each group, if needed
 - 2. 3 Change keys per cylinder.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
 - 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
 - 2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of polyurethane sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 HARDWARE SCHEDULE

- A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware", hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

Hardware Sets

1. MK - McKinney
2. PE - Pemko
3. RF - Rixson
4. SU - Securitron
5. RO - Rockwood
6. RU - Corbin Russwin
7. OT - By Others

Hardware Schedule

Set: 1.0

Doors: 238D, 238E

1 To Be Determined		OT
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Set: 2.0

Doors: X141

1 Cylinder as Required	626	RU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 3.0

Doors: X139

1 Cylinder as Required	626	RU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT

1 Balance of Hardware by Door Manufacturer OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 4.0

Doors: X133, X144

1 Cylinder as Required	626	RU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times. Authorized card in reader retracts latch and activates outside door actuator switch for a preset period of time. When active, pressing outside door actuator switch initiates door operator. Inside door actuator switch active at all times. Pressing inside door actuator switch retracts latch and initiates door operator.

Set: 5.0

Doors: X103A, X127

1 Cylinder as Required	626	RU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 6.0

Doors: X115B, X142

1 Cylinder as Required	626	RU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times. Authorized card in reader retracts latches and activates

outside door actuator switch for a preset period of time. When active, pressing outside door actuator switch initiates door operator. Inside door actuator switch active at all times. Pressing inside door actuator switch retracts latches and initiates door operator.

Set: 7.0

Doors: X101B

1 Cylinder as Required	626	RU
4 Pull RM2010-84 MP	US32D	RO
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times. Authorized card in reader retracts latches and activates outside door actuator switch for a preset period of time. When active, pressing outside door actuator switch initiates door operator. Inside door actuator switch active at all times. Pressing inside door actuator switch retracts latches and initiates door operator.

Set: 8.0

Doors: X107, X108, X109, X113, X114, X117, X137, X143

1 Cylinder as Required	626	RU
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 9.0

Doors: X124

1 Cylinder as Required	626	RU
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 10.0

Doors: X103B, X103C, X115A, X116, X128

1 Cylinder as Required	626	RU
1 Balance of Hardware by Door Manufacturer		OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 11.0

Doors: X101A

1 Cylinder as Required		626	RU
4 Pull	RM2010-84 MP	US32D	RO
1 Balance of Hardware by Door Manufacturer			OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 12.0

Doors: X123, X125

1 Cylinder as Required		626	RU
1 Balance of Hardware by Door Manufacturer			OT

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 13.0

Doors: X101C, X101D

4 Pull	RM2010-84 MP	US32D	RO
1 Balance of Hardware by Door Manufacturer			OT

Set: 14.0

Doors: 181

1 Cylinder as Required		626	RU
2 Pull	RM4412-18	US32D	RO
1 Card Reader by Security Contractor			HD
1 Power Supply by Security Contractor			OT
1 Balance of Hardware by Door Manufacturer			OT

description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 15.0

Doors: 244

1 Cylinder as Required		626	RU
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1 Balance of Hardware by Door Manufacturer OT

Set: 16.0

Doors: 201

1 Cylinder as Required		626	RU
2 Pull	RM4412-18	US32D	RO
1 Balance of Hardware by Door Manufacturer			OT

Set: 17.0

Doors: 230B, 230C

2 Pull	RM4412-18	US32D	RO
1 Balance of Hardware by Door Manufacturer			OT

Set: 18.0

Doors: 113, 230A

1 Cylinder as Required		626	RU
2 Pull	RM4412-18	US32D	RO
1 Balance of Hardware by Door Manufacturer			OT

Set: 19.0

Doors: 306

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Exit Device (PoE, rim, fail safe)	ED5200AN 1169603 IN220 IPS M110 AP		630
RU			

1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C**** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times. Fire alarm releases stair side trim allowing re-entry from the stair as required.

Set: 20.0

Doors: 213

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
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1 Electric Power Transfer	CEPT-C5E		SU
1 Exit Device (PoE, rim, fail secure)	ED5200AN 1169605 IN220 IPS M110 AP	630	
RU			
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C***** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 21.0

Doors: 223B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Exit Device (PoE, rim, fail secure)	ED5200N 1169605 IN220 IPS M110 AP	630	
RU			
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C***** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 22.0

Doors: 167, 184D, 200A

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Exit Device (PoE, SVR, fail secure)		ED5470BN	
1169S605 IN220 IPS M55 M110 AP 630		RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Silencer	608		RO
2 ElectroLynx Harness	PoE-C***** length of wires as required		MK

1 PoE Network Switch by Security Contractor			OT
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Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 23.0

Doors: 125B

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Electric Power Transfer	EL-CEPT		SU
2 Exit Device (surface vertical rod, passage)		ED5470B	
116910 M110 M55 M92 M93	630	RU	
1 Cylinder as Required		626	RU
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Silencer	608		RO
2 Magnetic Lock	M680BD		SU
4 ElectroLynx Harness	QC-C**** quantity x length of wires as required		MK
1 Timer	FA-XDT-24		SU
1 Keyswitch	MK		SU
1 Card Reader by Security Contractor			HD
1 Power Supply by Security Contractor			OT

Description: Access free at all times. Sensor integral with outside trim releases magnetic locks momentarily. Egress controlled by NFPA-101 compliant delayed egress system. Fire alarm shunts delay system and releases magnetic locks. Key switch resets delay system.

Set: 24.0

Doors: 125A

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	EL-CEPT		SU
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55 M92	630	RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
1 Cylinder as Required		626	RU
4 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
1 Magnetic Lock	M680BD		SU
1 Magnetic Lock	M680BDX		SU
2 ElectroLynx Harness	QC-C**** quantity x length of wires as required		MK
1 Push Button	EEB2		SU

1 Timer	FA-XDT-24	SU
1 Keyswitch	MK	SU
1 Card Reader by Security Contractor		HD
1 Power Supply by Security Contractor		OT

Notes: Astragals, if required, by door manufacturer.

Description: Doors normally closed and secured by magnetic locks. Access/egress in one direction limited by NFPA-101 compliant delayed egress system. Authorized card in reader momentarily shunts delay system allowing access/egress. Access/egress in opposite direction free at all times. Motion sensor integral to magnetic lock or emergency egress button momentarily release magnetic lock allowing free access/egress. Key switch resets delay system after fire alarm.

Set: 25.0

Doors: 200B

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	EL-CEPT		SU
2 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55 M92	630	RU	
2 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Cylinder as Required		626	RU
4 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Electromagnetic Holder	998	689	RF
1 Gasketing	S88D x LAR		PE
1 Magnetic Lock	M680BD		SU
1 Magnetic Lock	M680BDX		SU
1 ElectroLynx Harness	QC-C**** quantity x length of wires as required		MK
1 Push Button	EEB2		SU
1 Timer	FA-XDT-24		SU
1 Keyswitch	MK		SU
1 Card Reader by Security Contractor			HD

1 Power Supply by Security Contractor	OT
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Notes: Astragals, if required, by door manufacturer.

Description: Doors normally held open by magnetic door holders. Fire alarm releases holders allowing doors to close and latch as required. After hours, doors normally closed and secured by magnetic locks. Access/egress in one direction limited by NFPA-101 compliant delayed egress system. Authorized card in reader momentarily shunts delay system allowing access/egress.

Access/egress in opposite direction free at all times. Motion sensor integral to magnetic lock or emergency egress button momentarily release magnetic lock allowing free access/egress. Key switch resets delay system after fire alarm.

Set: 26.0

Doors: 220, 228

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (rim, passage)	ED5200A 116910 M110	630	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 27.0

Doors: 234

4 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (rim, passage)	ED5200A 116910 M110	630	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 28.0

Doors: 164

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (rim, passage)	ED5200A 116910 M110	630	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Surface Overhead Stop	10-X36	630	RF
1 Gasketing	S88D x LAR		PE

Set: 29.0

Doors: 126

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (rim, passage)	ED5200A 116910 M110	630	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 30.0

Doors: 214A

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (rim, classroom)	ED5200A 116955 M110 AP	630	RU

1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 31.0

Doors: 218

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Exit Device (surface vertical rod, passage)		ED5470B	
116910 M110 M55	630	RU	
2 Closer (surface)	DC6200	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE

Set: 32.0

Doors: 114

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Exit Device (surface vertical rod, passage)		ED5470B	
116910 M110 M55	630	RU	
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Silencer	608		RO

Set: 33.0

Doors: 214B, 214C

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, classroom)		ED5470B	
116955 M110 M55 AP	630	RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	

M110 M55	630	RU
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2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE

Set: 34.0

Doors: 193A, 193F, 193G

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, classroom)		ED5470B	
116955 M110 M55 AP	630	RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Electro-Mechanical Closer (single point)		DC62940	x ET
689	RU		
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE
2 Door Bottom	434APKL x LAR		PE

Description: Doors normally closed and secured. Authorized key in outside trim locks/unlocks outside trim. Egress free at all times. Door may be held open by holders integral to the door closers. Fire alarm releases closers allowing doors to close as required.

Set: 35.0

Doors: 193B, 193C, 193D, 193E

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Exit Device (surface vertical rod, classroom)		ED5470B	
116955 M110 M55 AP	630	RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
2 Electromagnetic Holder	998	689	RF
2 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE
2 Door Bottom	434APKL x LAR		PE

Description: Doors normally closed and secured. Authorized key in outside trim locks/unlocks outside trim. Egress free at all times. Door may be held open by magnetic holders. Fire alarm releases holders allowing doors to close as required.

Set: 36.0

Doors: 193H, 193J, 193K

2 Continuous Hinge	COS83FM-HD1		PE
1 Exit Device (surface vertical rod, classroom)		ED5470B	
116955 M110 M55 AP	630	RU	
1 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO

2 Electromagnetic Holder	998	689	RF
2 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE
2 Door Bottom	434APKL x LAR		PE

Description: Doors normally closed and secured. Authorized key in outside trim locks/unlocks outside trim. Egress free at all times. Door may be held open by magnetic holders. Fire alarm releases holders allowing doors to close as required.

Set: 37.0

Doors: 212, 223A

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Exit Device (surface vertical rod, exit only)		ED5470B	
M110 M55	630	RU	
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Electromagnetic Holder	998	689	RF
1 Gasketing	S88D x LAR		PE

Notes: Astragal, if required, by door manufacturer.

Description: Doors normally held open by magnetic holders. Fire alarm releases holders allowing doors to close and latch as required. Access/egress free at all times.

Set: 38.0

Doors: 158

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	EL-CEPT		SU
1 Exit Device (rim, classroom)	ED5200 D 116955 M110 AP	630	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO
2 ElectroLynx Harness	QC-C**** quantity x length of wires as required		MK

1 Card Reader by Security Contractor			HD
1 Power Supply by Security Contractor			OT

Description: Door normally closed and secured. Authorized key in outside trim locks/unlocks outside trim. Egress controlled by NFPA-101 compliant delayed egress system. When armed, authorized card in reader momentarily shunts delay system allowing egress.

Set: 39.0

Doors: 205, 210B, 226B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Lockset (PoE, fail secure)	ML20606 116T IN220 IPS SEC	626	RU

1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C**** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Description: Door normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 40.0

Doors: 193N

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Flush Bolt	2948	US26D	RO
1 Lockset (PoE, fail secure)	ML20606 116T IN220 IPS SEC	626	RU
1 Coordinator	26XX length as required for opening	Black	RO
2 Closer (surface)	DC6200	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C**** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Notes: Astragal, if required, by door manufacturer.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 41.0

Doors: 193L, 193M, 193P

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
1 Flush Bolt	2948	US26D	RO
1 Lockset (PoE, fail secure)	ML20606 116T IN220 IPS SEC	626	RU
1 Coordinator	26XX length as required for opening	Black	RO
2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

2 ElectroLynx Harness	PoE-C**** length of wires as required	MK
1 PoE Network Switch by Security Contractor		OT

Notes: Astragal, if required, by door manufacturer.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 42.0

Doors: 225, 245

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Electric Power Transfer	CEPT-C5E		SU
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Lockset (PoE, fail secure)	ML20606 116T IN220 IPS SEC	626	RU
1 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE
2 ElectroLynx Harness	PoE-C***** length of wires as required		MK
1 PoE Network Switch by Security Contractor			OT

Notes: Astragal, if required, by door manufacturer.

Description: Doors normally closed and secured. Authorized card at reader or key in outside trim allow access. Egress free at all times.

Set: 43.0

Doors: 161, 177A, 178B, 202A, 202B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (passage)	ML2010 116T	626	RU
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 44.0

Doors: 177B, 204A

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (passage)	ML2010 116T	626	RU

1 Surface Overhead Stop	10-X36	630	RF
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3 Silencer	608	RO
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Set: 45.0

Doors: 132, 133, 173, 182

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (privacy)	ML2030 116T M19V	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 46.0

Doors: 304, 305

4 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (privacy)	ML2030 116T M19V	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
4 Silencer	608		RO

Set: 47.0

Doors: 129, 203

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (privacy)	ML2030 116T M19V	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 48.0

Doors: 116, 134, 174, 175, 176, 184, 185, 206, 207, 208, 209, 231, 232, 308

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	ML2051 116T AP	626	RU
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 49.0

Doors: 117, 162

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	ML2051 116T AP	626	RU
1 Concealed Overhead Stop	2-X36	630	RF
3 Silencer	608		RO

Set: 50.0

Doors: 217

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	ML2051 116T AP	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 51.0

Doors: 178A, 210A

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (classroom)	ML2055 116T AP	626	RU
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 52.0

Doors: 124, 127, 128, 171, 216A, 216B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (classroom)	ML2055 116T AP	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 53.0

Doors: 137B, 157, 226A, 239A, 239B, 241, 242A, 242B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (classroom)	ML2055 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 54.0

Doors: 145A

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (classroom)	ML2055 116T AP	626	RU
1 Closer (surface)	DC6210 A4	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 55.0

Doors: 146C, 165A, 165B, 172

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 56.0

Doors: 183

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Surface Overhead Stop	10-X36	630	RF
3 Silencer	608		RO

Set: 57.0

Doors: 135, 156, 310

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 58.0

Doors: 229A

3 Hinge (heavy weight)	T4A3786 5" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 59.0

Doors: 106, 107, 110, 122, 142, 160, 221, 303

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 60.0

Doors: 136

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 61.0

Doors: 121

4 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
4 Silencer	608		RO

Set: 62.0

Doors: 152, 180

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 63.0

Doors: 229C

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO

1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Set: 64.0

Doors: 146B, 146D, 155B, 155C, 155D, 155E, 155F, 166A, 166B, 166C, 166D

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (privacy)	ML2060 116T M19V	626	RU
1 Closer (surface)	DC6200	689	RU

1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO

3 Silencer	608		RO
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Set: 65.0

Doors: 146A, 146E, 155G, 166E

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Mortise Lock (privacy)	ML2060 116T M19V	626	RU
1 Closer (surface)	DC6210 A3	689	RU
1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 66.0

Doors: 115, 123, 130, 131

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Pull	RM4412-18	US32D	RO
1 Push Plate	70 12 x 16	US32D	RO
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 67.0

Doors: 235, 237

4 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Pull	RM4412-18	US32D	RO
1 Push Plate	70 12 x 16	US32D	RO
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO

1 Mop Plate	K1050 4" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
4 Silencer	608		RO

Set: 68.0

Doors: 145B, 151, 155A, 170A, 170B

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Pull	RM4412-18	US32D	RO
1 Push Plate	70 12 x 16	US32D	RO
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 69.0

Doors: 137D

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Deadbolt	DL4113 PR33V57 AP	626	RU
1 Push Plate	70 12 x 16	US32D	RO
1 Closer (surface)	DC6200	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 70.0

Doors: 137C

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Deadbolt	DL4113 PR33V57 AP	626	RU
1 Push Plate	70 12 x 16	US32D	RO
1 Closer (surface)	DC6210 A3	689	RU
1 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
3 Silencer	608		RO

Set: 71.0

Doors: 149

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Flush Bolt	2948	US26D	RO
1 Mortise Lock (classroom)	ML2055 116T AP	626	RU
1 Coordinator	26XX length as required for opening	Black	RO

2 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Notes: Astragal, if required, by door manufacturer.

Set: 72.0

Doors: 147, 150, 155H, 233

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
2 Wall Stop	409	US32D	RO
2 Silencer	608		RO

Set: 73.0

Doors: 102

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
2 Surface Overhead Stop	10-X36	630	RF
2 Astragal	303ASTST x LAR		PE
1 Gasketing	S88D x LAR		PE
2 Door Bottom	434APKL x LAR		PE

Set: 74.0

Doors: 139A, 139B, 143, 153, 154, 168, 186, 211, 224, 224A, 224B, 227A, 227B, 229B, 238A, 240, 300, 301, 309

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Notes: Astragal, if required, by door manufacturer. Mount closer on active leaf only.

Set: 75.0

Doors: 144, 187, 191A, 191B

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A4	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO

1 Surface Overhead Stop	10-X36	630	RF
2 Silencer	608		RO

Notes: Mount closer on active leaf and OH stop on inactive leaf.

Set: 76.0

Doors: 229D

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU
1 Closer (surface)	DC6210 A4	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
1 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Notes: Mount closer on active leaf. Mount wall stop for inactive leaf.

Set: 77.0

Doors: 219

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Mortise Lock (storeroom)	ML2057 116T AP	626	RU

1 Closer (surface)	DC6210 A3	689	RU
2 Kick Plate	K1050 12" x 2" LDW	US32D	RO
2 Wall Stop	409	US32D	RO
1 Gasketing	S88D x LAR		PE

Notes: Mount closer on active leaf.

Set: 78.0

Doors: 137A

2 Concealed Closer	MW806 90N	626	RF
2 Flush Bolt	557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Deadbolt	DL4113 PR33V57 AP	626	RU
4 Push Plate	70 12 x 16	US32D	RO
2 Armor Plate	K1050 36" x 2" LDW	US32D	RO

Set: 79.0

Doors: 202C, 202D

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Roller Latch	590	US26D	RO
2 Pull	RM730-6	US26D	RO
2 Wall Stop	409	US32D	RO

2 Silencer	608		RO
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Set: 80.0

Doors: 204B

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2 Roller Latch	590	US26D	RO
2 Pull	RM730-6	US26D	RO
2 Surface Overhead Stop	55-X36	652	RF
2 Silencer	608		RO

Set: 81.0

Doors: 198, 199B

Description: Basis of Design FL#16353.2 +/-50 psf

3 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
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1 Mortise Lock (security storeroom)	ML2059 116T AP	626	RU
1 Surface Overhead Holder	10-X16	630	RF
1 Threshold	2008A x LAR		PE
1 Gasketing	312CR x LAR		PE
1 Gasketing	S44W x LAR		PE
1 Gasketing	315CN x LAR		PE
1 Gasketing	S771W x LAR		PE
1 Gasketing	P242 x LAR		PE
1 Gasketing	P381 x LAR		PE
1 Gasketing	P385 x LAR		PE
1 Rain Guard	346C x door width plus 4 inches		PE

Notes: Exterior opening to comply with FBC windstorm requirements.

Set: 82.0

Doors: 199A

Description: Basis of Design FL#16353.4 +/-60 psf

6 Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
2 Flush Bolt	556WS	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Removable Mullion	FE707A 7' 6P		RU
1 Mortise Lock (security storeroom)	ML2059 116T AP	626	RU
2 Surface Overhead Holder	10-X16	630	RF

1 Threshold	2008A x P255 x P261 x LAR		PE
1 Gasketing	312CR x LAR		PE
1 Gasketing	315CN x LAR		PE
1 Gasketing	S771W x LAR		PE
1 Gasketing	P266 x LAR		PE
1 Gasketing	P385 x LAR		PE
1 Rain Guard	346C x door width plus 4 inches		PE

Notes: Exterior opening to comply with FBC windstorm requirements.

END OF SECTION 08710

END OF SECTION

SECTION 088000 - 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 doors, interior borrowed lites, and glazed curtain walls.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Division 8 Section "Mirrors."

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.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

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 other than clear monolithic vision glass; 12 inches (300 mm) square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.

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.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

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 (4.4 deg C).

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 E 1300.
 - 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 (25 mm), whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with protection testing requirements in ASTM E 1996 for Wind Zone indicated on the project drawings when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.
 - 1. Large-Missile Test: For glazing located within 30 feet (9.1 m) of grade.
 - 2. Small-Missile Test: For glazing located more than 30 feet (9.1 m) above 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.
 - 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

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 SGCC or another certification agency acceptable to

authorities having jurisdiction or manufacturer. 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: 12 mm.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- 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 C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. 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 interlayer recommended by manufacturer for application indicated 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. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
 - 3. Ionomeric polymer interlayer.
 - 4. Cast-in-place and cured-transparent-resin interlayer.
 - 5. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

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. Field-applied sealants shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.7 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

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.
 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 (67 deg C), ambient; 180 deg F (100 deg C), 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 (1270 mm).
 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 (3-mm) 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.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 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 Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. 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.
- E. Install gaskets so they protrude past face of glazing stops.

3.5 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.

3.6 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.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type "T": Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.

3.8 LAMINATED GLASS SCHEDULE

- A. Glass Type "L": Laminated glass with two plies of heat-strengthened float glass.
 - 1. Product: Viracon "VS 3-20", stainless steel reflective laminated, with an outer ply of grey glass and VS-20 coating on the #2 surface, an interlayer as required for the performance requirements, and an interior ply of clear glass.
 - 2. Minimum Thickness of Each Glass Ply: 6 mm.
 - 3. Interlayer Thickness: As required for performance requirements.
- B. Glass Type "S": For use in spandrel applications, Same as type "L" except opaque with a ceramic frit on the surface recommended by the glass fabricator and an appearance from exterior side similar to that of type "L"

END OF SECTION

SECTION 088300 - MIRRORS

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 the following types of silvered flat glass mirrors:
 - 1. Tempered glass mirrors qualifying as safety glazing.
- B. Related Requirements:
 - 1. Division 8 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
 - 2. Division 10 Section "Toilet, Bath, and Laundry Accessories" for mirrors at Restrooms.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
 - 1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
 - 2. Mirror Trim: 12 inches (300 mm) long.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
 - 1. Nominal Thickness: 6.0 mm.
- C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

- A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

1. Adhesive shall have a VOC content of 70 g/L or less.

2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
 1. Bottom and Side Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm). Side trim is only to be installed at end condition of mirror grouping.
 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
 3. Finish: Clear bright anodized.
- B. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
 - 1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
 - 2. Install mastic as follows:
 - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
 - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

SECTION 092500 - GYPSUM BOARD ASSEMBLIES

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 the following:
 - 1. Nonload-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Framing and Furring:
 - a. Clark Dietrich Building System
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc.
 - d. Clark Deitrich Building System
 - e. Marino/Ware (formerly Marino Industries Corp.).
 - f. National Gypsum Co.; Gold Bond Building Products Division.
 - g. Unimast, Inc.
 - 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. Rockfon North America
 - c. USG Interiors, Inc.
 - 3. Gypsum Board and Related Products:
 - a. American Gypsum Co.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.

- B. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
 - 1. Protective Coating: ASTM A 653, G 40 hot-dip galvanized coating.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1. Thickness: 0.0179 inch (25 gage) unless otherwise indicated.
 - 2. Thickness: 0.0329 inch, (20 gauge) as follows:
 - a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
 - 3. Depth: 3 5/8" unless otherwise indicated on drawings.
- C. Steel Furring Studs and Runners at interior side of exterior walls: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 - 1. Thickness: 0.0179 inch (25 gage) unless otherwise indicated.
 - 2. Depth: 1-5/8 inches, unless otherwise indicated on drawings.
- C. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
 - 1. Widths: Provide gypsum board in widths of 48 inches.
- B. Gypsum Wallboard: ASTM C 36 and as follows:
 - 1. Type: Regular for vertical surfaces, unless otherwise indicated.
 - 2. Type: Type X where required for fire-resistance-rated assemblies.
 - 3. Type: Moisture resistant where indicated on project drawings
 - 4. Edges: Tapered.
 - 5. Thickness: 5/8 inch unless otherwise indicated on drawings.
 - 6. Type: Sag-resistant for ceiling surfaces ("ceiling board") 1/2" thick, minimum.

2.5 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Plastic
2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. J-bead with both face and back flanges; face flange formed to receive joint compound. Use J-beads for edge trim, unless otherwise indicated.
 - c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
- B. Accessory for Curved Edges: Cornerbead formed of plastic with either notched or flexible flanges that are bendable to curvature radius.

2.6 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
- C. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 1. Ready-Mixed Formulation: Factory-mixed product.
 - a. All-purpose compound formulated for both taping and topping compounds.

2.7 SOUND ATTENUATION BLANKETS

- A. 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.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of

2.8 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, door bumpers, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Suspend ceiling hangers from building 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 structural or ceiling suspension system. 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 the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 - 3. Do not attach hangers to steel deck tabs.
 - 4. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing to height indicated on project drawings. Where partitions are indicated to extend to underside of deck above, continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring in sizes and at spacings indicated.
1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. 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.
- D. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- H. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide ¼- to ½-inch wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with elastomeric sealant.
- I. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- J. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles of framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:

1. Fasten with screws.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 2. Install aluminum trim and other accessories where indicated.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 2. Level 2 where panels form substrates for tile and where indicated.
 3. Level 4 for gypsum board surfaces, unless otherwise indicated.
- E. Use one of the following joint compound combinations as applicable to the finish levels specified:
 1. Embedding and First Coat: Ready-mixed drying-type, all purpose or taping compound. Fill (second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and

sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

- G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and soffits and report any deficiencies in the work observed. Do not proceed with installation of gypsum board to ceiling or soffit support framing until deficiencies have been corrected.
 - 1. Notify architect one week in advance of the date and the time when the project, or part of the project, will be ready for an above-ceiling observation.
 - 2. Prior to notifying architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.11 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 095113 - 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 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section includes ceilings composed of acoustical panels, exposed suspension systems, and suspension trim.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
- B. Product data for each type of product specified.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-response tests are performed by a qualified testing and inspecting agency. Qualified testing and inspecting agencies include Underwriters Laboratories (UL), Warnock Hersey, or another agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 - 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
- D. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- E. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components and suspension trim to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, 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.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 1. Acoustical Ceiling Panels: Furnish quantity of full-size units equal to 5 percent of each type installed.
 2. Suspension System Components: Furnish quantity of each component equal to 5.0 percent of amount installed.
 3. Suspension Trim Components: Furnish quantity of each component equal to 5.0 percent of amount installed.
 4. Attic stock shall be delivered to the project site at the same time as the delivery of the required project materials, and shall be from the same production run as that used for the project installation. The attic stock shall be separately packaged and marked with a label "OWNER'S ATTIC STOCK - DO NOT USE", and shall be delivered to the Owner's storage facility, and a receipt obtained for submittal with Final Closeout documents.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL:

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 1. Mounting Method for Measuring NCR: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface) per ASTM E 795.
- B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.2 MANUFACTURES

- A. Ceiling Panels:
 1. Armstrong World Industries, Inc.

2. USG Interiors , Inc.
3. Rockfon North America
4. CertainTeed

2.3 ACOUSTICAL PANELS

- A. Armstrong "Cirrus" (teqular, fine texture – 589SP) or equal product by the other manufacturers listed
 1. Panel size for 24" x 24" suspended grid.
 2. Color: White, Standard.
 3. Pattern: To match existing
 4. LR: .75 minimum
 5. CAC: Not less than 35 in accordance with ASTM E1414. Product to have UL acoustical compliance.
 6. Edge Detail: Tegular edge to match existing with reveal sized to fit flange of exposed suspension system members.
 7. Thickness: 3/4" inch minimum.
 8. Panels shall be humidity resistant to inhibit sag.
 9. Panels shall be mold and mildew resistant.
 10. ASTM E 84, Class A
 11. Panel Warranty: Provide a 10 year system warranty that shall be free from manufacturing defects.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements. Provide hot dipped galvanized suspension systems.
- B. Finishes and Colors: Provide color factory-applied finish for type of system indicated. Colors to be selected by the Architect.
- C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

2.5 SUSPENSION SYSTEMS:

- A. General: ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish; color: Flat White #050 or as selected from manufacturer's standard colors.
- B. Available Products: Armstrong Industries "Suprafine ML" or equal products by USG Interiors, Chicago Metallic, or CetrtainTeed
- C. Main Tees and Cross Tees: UL Classified Intermediate Duty Classification with top bulb, 9/16" wide bottom face, cross tee holes and hanger wire holes at 6" o.c. Main tees and cross tees shall be positively locked, yet shall be removable without the use of tools.

- D. Wall Molding: Angle shape; 1" mounting flange by 9/16" face flange; hemmed edges; exposed surface pre-finished to match suspension system components.
- E. Inside Corner: Field-mitered joints at wall molding.
- F. Outside Corner: Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
- G. Attachment devices: Hanger Wire: Galvanized carbon steel; soft temper; pre-stretched; yield stress load at least three times the design load but not than 12-gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and 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. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and Cisca "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636, and standards of this specification.
- 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 the supporting structure or of the 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 the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and

that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
- 3.4 CLEANING
- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's 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.

END OF SECTION

SECTION 096466 - WOOD SPORTS-FLOOR 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. This Section includes wood sports-floor assemblies.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood sports-floor assemblies.
- B. Shop Drawings: Show installation details including location and layout of each type of floor assembly and accessory. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Layout, colors, widths, and dimensions of game lines and markers.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Floor finish.
- D. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches long and of same thickness and material indicated for the Work.
 - 1. Include sample sets showing the full range of normal color and texture variations expected in wood flooring.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For wood sports-floor assemblies and finish systems to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood sports-floor assembly installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
 - 1. Installer responsibilities include installation and field finishing of wood sports-floor assembly components and accessories.

- B. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.6 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood sports-floor assemblies during the conditioning period.
 - 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood sports-floor assemblies until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood sports-floor assemblies after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Wood Floor
 - a. Aacer Flooring, LLC.
 - b. Action Floor Systems, LLC.
 - c. Connor Sports Flooring, Inc.

- d. Horner Flooring Company, Inc.
- e. Mondo.
- f. Robbins Sports Surfaces.
- g. WD Flooring, LLC.

2. Finishing Materials

- a. Basic Coatings.
- b. BonaKemi USA, Inc.
- c. Crawford Laboratories.
- d. Hillyard Inc.
- e. Huntington Laboratories, Inc.
- f. National Coatings, Co.

3. Basis of Design:

- a. Connor Sports Flooring: "NeoShok".

2.2 FLOORING MATERIALS

- A. Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.

- 1. Grade: MFMA-RL Second and Better.
- 2. Cut: Edge grain.
- 3. Thickness: 25/32 inch.
- 4. Face Width: 2-1/4 inches.
- 5. Backs: Channeled (kerfed) stress relief.
- 6. Preservative Treatment: Clear, penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi; complying with MFMA's written recommendations and applied by immersion.

2.3 SUBFLOOR MATERIALS

- A. Plywood Underlayment: Two layers of APA rated, C-D plugged, Exposure 1, tongue and groove sheathing, 15/32 inch thick.
- B. Resilient Pads: With air voids for resiliency and installed at manufacturer's standard spacing for product designation indicated above.
 - 1. Type: Hemispherical Red-70D Durometer.
 - 2. Material: Polyurethane or neoprene.
 - 3. Thickness: 3/4 inch.

2.4 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Type: MFMA Group 5, Water Based Finishes, polyurethane.
 - 2. Floor-Sealer Formulation: Pliable, penetrating type.

3. Finish-Coat Formulation: Formulated for gloss finish and multicoat application.

2.5 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick.
- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches with premolded outside corners.
 1. Color: Black.
- C. Thresholds: As specified in Division 8 Section "Door Hardware".
- D. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by sports-floor manufacturer.
- F. Adhesives: Manufacturer's standard for application indicated.
 1. Concrete Primers: Manufacturer's standard for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of sports-floor assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete slabs comply with requirements specified in Division 3 Section "Cast-in-Place Concrete".
 1. Moisture Testing:
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Perform test so that each test area does not exceed 200 sq. ft. and perform not less than 2 tests in each installation area and with test areas evenly spaced in installation areas.
 - 2) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform plastic sheet test, ASTM D 4263. Proceed with installation only after testing indicates absence of moisture in substrates.

- 1) Proceed with installation only if there is no evidence of condensation or clouding in 24 hours.
- c. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with sports-floor assembly manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches and sealed.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Strip Flooring: Mechanically fasten perpendicular to supports.
- G. Installation Tolerances: 1/8 inch in 10 feet of variance from level.

3.4 SANDING AND FINISHING

- A. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."

- B. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than two coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.

3.5 PROTECTION

- A. Protect sports floors during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 - 1. Do not cover sports floors after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 - 2. Do not move heavy and sharp objects directly over sports floors. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over sports floors.

END OF SECTION

SECTION 096513 - RESILIENT STAIR 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. Resilient stair accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of product indicated.

1.4 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 (10 deg C) or more than 90 deg F (32 deg C).

1.5 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 time 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 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Basis of Design: Burke, Endura line
- C. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; A Tarkett Company.
 - 5. Roppe Corporation, USA.
- D. Stair Treads: ASTM F 2169.
 - 1. Type: TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
 - 2. Class: 2 (pattern; embossed, grooved, or ribbed). Provide with raised circular disk design.
 - 3. Group: 2 (with contrasting color for the visually impaired).
 - 4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 - 5. Nosing Height: 1-1/2 inches.
 - 6. Thickness: 1/4 inch and tapered to back edge.
 - 7. Size: Lengths and depths to fit each stair tread in one piece.
- E. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
 - 1. Style: Toeless, by length matching treads.
 - 2. Thickness: 0.125 inch.
- F. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- G. Locations: Open stair and intermediate Landing in Fitness 130.
- H. Colors and Patterns: As selected by Architect from full range of industry 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 comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

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. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to 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. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the 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.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. 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. 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 exposed surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519 - RESILIENT FLOOR TILE AND BASE

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 the following:
 - 1. Vinyl composition tile (VCT).
 - 2. Resilient wall base

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

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 (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.

- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 VINYL COMPOSITION TILE (VCT).

- A. Vinyl Composition Tile (VCT) shall be Mannington Commercial Premium Tile, ASTM F 1066. Refer to drawings for floor pattern.
 - 1. Solidpoint, 348 Pottery
 - 2. Solidpoint, 337 Toasted Sesame
 - 3. Solidpoint, 317 Cool Beige
 - 4. Brushwork Brights, 725 Hunter Green
- B. Class: 2 (through-pattern tile).
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch (3.2 mm).
- E. Size: 12 by 12 inches (305 by 305 mm).
- F. Fire-Test-Response Characteristics:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

2.4 RESILIENT WALL BASE , RB.

A. Wall Base (RB): ASTM F 1861.

1. AFCO-USA, American Floor Products Company, Inc.
2. Armstrong World Industries, Inc.
3. Azrock Commercial Flooring, DOMCO.
4. Burke Mercer Flooring Products.
5. Endura.
6. Estrie, American Biltrite (Canada) Ltd.
7. Johnsonite.
8. Marley Flexco (USA), Inc.
9. Mondo Rubber International, Inc.
10. Musson, R. C. Rubber Co.
11. Nora Rubber Flooring, Freudenberg Building Systems, Inc.
12. Pirelli Rubber Flooring.
13. Roppe Corporation.
14. Stoler Industries.
15. VPI, LLC, Floor Products Division.

B. Type (Material Requirement): TP (rubber, thermoplastic).

C. Color: Black

D. Group (Manufacturing Method): I (solid).

E. Style: Cove (with top-set toe).

F. Minimum Thickness: 0.125 inch (3.2 mm).

G. Height: 4 inches (102 mm).

H. Lengths: Coils in manufacturer's standard length.

I. Outside Corners: Job formed, except use preformed where there is 4 inches or less of wall return available for adhering at one leg of corner.

J. Inside Corners: Job formed.

K. Surface: Smooth.

2.5 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 manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: 50 g/L.
 - b. Cove Base Adhesives: 50 g/L.
 - c. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 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.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 3. Moisture Testing:
 - a. Perform 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. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.
- G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
1. Lay tiles square with room axis.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- F. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

3.5 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 - 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
 - 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 096566 – RESILIENT ATHLETIC FLOORING

PART 1 – GENERAL

1.1 SUMMARY

1.1.1 Products Supplied

- A. Resilient (rubber) athletic flooring.
- B. Adhesive and accessories required for installation, maintenance and repair.

1.2 REFERENCES

1.2.1 American Society for Testing & Materials (ASTM)

- A. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
- B. ASTM D2240: Standard Test Method for Rubber Property (Durometer Hardness).
- C. ASTM D3389: Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader).
- D. ASTM F970: Standard Test Method for Static Load Limit.
- E. ASTM D2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine.
- F. ASTM G21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- G. ASTM F925: Standard Test Method for Resistance to Chemicals of Resilient Flooring.
- H. ASTM E648: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- I. ASTM E662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- J. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- K. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- L. ASTM E1745: Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- M. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.2. National Fire Protection Association

- A. NFPA 101: Life Safety Code.

1.3 SUBMITTALS

1.3.1 Action Submittals

- A. Provide Manufacturer's current printed data sheets on specified products (surfacing product, adhesives, accessories, etc.).
- B. Provide samples, 6 inches x 6 inches, for verification of such characteristics as color, texture and finish for each specified rubber athletic flooring product.
- C. As necessary, provide shop drawings prepared for project illustrating layouts, details, dimensions and other data.

1.3.2 Informational Submittals

- A. Provide current subfloor preparation guidelines, as published by the Manufacturer.
- B. Provide current installation guidelines, as published by the Manufacturer.

1.3.3 Closeout Submittals

- A. Provide current maintenance guidelines, as published by the Manufacturer.
- B. Manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer must have experience in the manufacturing of prefabricated rubber athletic flooring.
- B. Installer must have performed installations of the same scale in the last three (3) years.
- C. Installer to be recognized and approved by the rubber athletic flooring Manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Materials must be delivered in Manufacturer's original, unopened and undamaged containers with identification labels intact.
- B. Store material upright on a clean, dry, flat surface protected from all possible damage, and protect from exposure to harmful weather conditions.
- C. Recommended environmental condition for storage is a minimum of 55 degrees F.
- D. Do not install any materials which suffer damage during handling (i.e. edge chipping, excessive warping, etc.).

1.6 SITE CONDITIONS

- A. The General Contractor or Construction Manager shall be responsible for ensuring all site conditions meet the requirements of the rubber athletic flooring Manufacturer, as referenced herein at sections 3.2 and 3.3.
- B. Maintain a stable room and subfloor temperature for a period of 48 hours prior, during and 48 hours after installation. Recommended range: 65oF to 86oF.
- C. Installation to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength).
- D. Moisture vapor emission content of the concrete slab must not exceed the tolerance of the adhesive used, when tested using the anhydrous calcium chloride test as per ASTM F1869 and/or using the in-situ probes test as per ASTM F2170.

1.7 WARRANTY

- A. Provide Manufacturers' warranty.
- B. The rubber athletic flooring is warranted to be free from manufacturing defects for a period of three (3) years from the date of substantial completion of the project.

PART 2 – PRODUCT

2.1 MANUFACTURED PRODUCTS

2.1.1 Manufacturers

- A. Mondo America Inc.:

B. Mondo USA:

C. Other manufacturer of equivalent product if approved as equivalent by the architect.

2.1.2 Description

A. Basis of Design: Mondo Ramflex, prefabricated rubber athletic flooring, calendered and vulcanized with a base of natural and synthetic rubbers, stabilizing agents and pigmentation.

B. Thickness: 0.394" (10mm).

C. Colors: provided in standard, solid background colors with random marbleization throughout material.

D. Texture: hammered.

E. Manufactured in two layers which are vulcanized together. The shore hardness of the top layer will be greater than that of the bottom layer; shore hardness of layers to be recommended by the Manufacturer and the limits specified.

F. Provide material available in sheets: 6' (1.83m) wide and 19' to 33' (6m to 10m) long.

2.1.3 Performance

A. Performance of the prefabricated rubber athletic flooring to conform to the following criteria:

Performance Criteria Test Method Result

Tensile Strength ASTM D412-06 ≥ 500 psi

Elongation at Break ASTM D412-06 $\geq 150\%$

Hardness (Shore A) ASTM D2240-05

80 \pm 5 (Top Layer)

70 \pm 5 (Bottom Layer)

Abrasion Resistance

(H18 Wheel 1000 cycles 1000g load)

ASTM D3389-05 ≤ 0.5 grams loss

Static Load Limit (250 Lbs) ASTM F970-06 ≤ 0.009 inch

Coefficient of Friction ASTM D2047-04 Dry ≥ 0.80

Fungal Resistance Test ASTM G21-96 No Growth

Chemical Resistance ASTM F925-02 No Surface Attack

Critical Radiant Flux ASTM E 648-06 $\geq 0.45\text{W/cm}^2$, Class 1

Optical Smoke Density ASTM E662-06 < 450

GREENGUARD Certification Yes

2.2 ACCESSORY PRODUCTS

A. Provide adhesive certified by rubber athletic flooring manufacturer: PU 105 polyurethane adhesive. Refer to current guidelines on product mixing and use, as published by the Manufacturer. EP 55 epoxy adhesive may be used in areas that have not been specified for use with Mondo Everlay, and that will not be subject to impacts or dynamic loads such as bleachers.

B. Patching or leveling compound to be supplied and/or recommended/approved by rubber athletic flooring Manufacturer.

PART 3 – EXECUTION

3.1 INSTALLERS

A. Refer to section 1.4 of this document for information on installers.

3.2 EXAMINATION

- A. Concrete subfloors to be placed a minimum of twenty-eight (28) days prior to the installation of rubber athletic flooring.
- B. Concrete subfloors on or below grade are installed over a suitable moisture retardant membrane. Water vapor membrane complies with specification in ASTM E1745.
- C. No concrete sealers or curing compounds are applied or mixed with the subfloors (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).
- D. Moisture and alkalinity tests must be preformed. Moisture content must not exceed the capacity of the specified adhesive (verify using the anhydrous calcium chloride test as per ASTM F1869 and/or in-situ probes test as per ASTM F2170) and pH level should be in the range of 7 to 8.5.
- E. Smooth, dense finish, highly compacted with a tolerance of 1/8" in a 10 ft radius (3.2 mm in 3.05 m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

3.3 PREPARATION

3.3.1 Subfloors

- A. Prepare concrete subfloor in accordance with Manufacturer's current printed Subfloor Preparation guidelines.

3.4 INSTALLATION

3.4.1 Installation of Sheet Goods

- A. Install rubber athletic flooring in accordance with Manufacturer's current printed Installation Manual.

3.5 REPAIR

- A. Repair material must be from the same dye lot as material supplied for initial installation.
- B. Repairs are to be performed by qualified installers/technicians only.

3.6 CLEANING

- A. Initial cleaning should only be performed 72 hours after the rubber athletic surface has been completely installed.
- B. Maintain rubber athletic flooring according to Manufacturer's current maintenance instructions for specified product.

3.7 PROTECTION

- A. Rubber athletic flooring surface can be protected with 1/8" Masonite during and after the installation, prior to acceptance by the Owner.

END OF SECTION

SECTION 096710 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work of this Section.

1.2 SUMMARY

- A. Work of this section includes all labor, materials, equipment and services necessary to complete the resinous flooring as scheduled on the drawings and specified herein.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the resinous flooring.
- C. Samples:
 - 1. Submit 2-1/2" x 4" color samples of resinous flooring material for initial color selection by the architect.
 - 2. Submit 12" x 12" sample for selection of surface texture.
- D. Material certificates signed by manufacturer certifying that the resinous flooring complies with requirement specified herein.
- E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer or applicator who has specialized in installing resinous flooring types similar to that required for this project and who is acceptable to manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain flooring system materials, including primers, resins, hardening agents, quartz granule aggregates, and finish or sealing coats, from a single manufacturer.
- C. Requests for substitution: Request for material approvals must be submitted to the architect two weeks prior to the bid date, including complete application specifications, physical characteristics and chemical data. Requests will not be accepted after this date. Failure of performance requires immediate removal and replacement of substitute materials with those originally specified at no cost to the owner, architect, or construction manager.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with resinous flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect work.
- B. Lighting: Permanent lighting shall be in place and working before installing resinous flooring.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Resinous flooring shall be decorative quartz epoxy flooring, Dex-O-Tex "Decor-Flor" as manufactured by Crossfield Products Corp., Rancho Dominguez, California; Roselle Park, New Jersey; Hinsdale, Illinois; Marietta, Georgia; Tacoma, Washington.
- C. Anti-Microbial Additive: Incorporate anti-microbial chemical additive to control growth of most bacteria, fungi, algae, and actinomycetes.

2.2 PROPERTIES

- A. Physical Properties: Provide decorative quartz epoxy flooring system that meets or exceeds the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.
 - 1. Compressive Strength: (ASTM C-109) 8,556 psi
 - 2. Tensile Strength: (ASTM D-638) 4,400psi
 - 3. Surface Hardness: (ASTM D-2240) Durometer "D" 85
 - 4. Water Absorption: (MIL-D-3134) Less than 1%.
 - 5. Indentation: (MIL-D-3134) 0.005 indentation
 - 6. Impact Resistance: 0.011 indentation; no cracking or loss of bond
 - 7. Adhesion: (A.C.I. Comm. No. 403) 345psi
 - 8. Flammability: (NFPA 101) Class 1 Interior Finish

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where the resinous flooring is to be installed and notify the architect of conditions detrimental to the proper and timely completion of the work. Do

not proceed with the work until unsatisfactory conditions have been corrected by the contractor in conformance with the Contract Documents.

3.2 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to resinous flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for application of flooring.
- B. Concrete Surfaces: Shot-blast as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.
- C. Materials: Mix epoxy resin components when required, and prepare materials according to resinous flooring system manufacturer's instructions.

3.3 APPLICATION

- A. General: Apply each component of resinous flooring system according to manufacturer's directions to produce a uniform, monolithic, surface of thickness indicated.
- B. Broadcast Coats: Apply liberal application of clear epoxy resin mixture, allow to self-level. Broadcast (by hand or spray machine) ceramic-coated quartz aggregate, allow to set to hardness, sweep off excess unbonded aggregate and repeat process to achieve total minimum nominal thickness of 1/16" – 1/8".
- C. Finish or Sealing Coats: After quartz-filled broadcast coats have cured sufficiently, apply finish coats of type recommended by flooring manufacturer to produce finish matching approved submittal sample and in number of coats and spreading rates recommended by manufacturer.
 - 1. Finished floor shall be minimum 1/8" thick, uniform in color and free of trowel marks.
- D. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

3.4 CURING, PROTECTION AND CLEANING

- A. Cure decorative quartz epoxy flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

SECTION 096800 – CARPET

1.0 GENERAL

1.1 SECTION INCLUDES

- A. Broadloom carpet, direct glued to substrate.
- B. Accessories.

1.2 REFERENCES

- A. American Association of Text broadloom Chemists and Colorists (AATCC):
 - 1. AATCC 16-[98], Test Method for Colorfastness to Light.
 - 2. AATCC 23-[99], Test Method for Colorfastness to Burnt Gas Fumes.
 - 3. AATCC 107-[97], Test Method for Colorfastness to Water.
 - 4. AATCC 109-[97], Test Method for Colorfastness to Ozone in The Atmosphere Under Low Humidities.
 - 5. AATCC 117-[99], Test Method for Colorfastness to Heat: Dry (Excluding Pressing).
 - 6. AATCC 134-[96], Test Method for Electrostatic Propensity of Carpets.
 - 7. AATCC 165-[93], Test Method for Colorfastness to Crocking: Carpets - AATCC Crockmeter Method.
 - 8. AATCC 174-[98], Test Method for Antimicrobial Activity Assessment of Carpets.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D418, Methods of Testing Pile Yarn Floor Covering Construction.
 - 2. ASTM E648, Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 3. ASTM E662, Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- C. Carpet & Rug Institute (CRI):
 - 1. CRI Indoor Air Quality Testing and Labeling Program.

D. U.S. Department of Housing and Urban Development (HUD):

1. HUD UM44D-[93], HUD Building Product Standards and Certification Program for Carpet.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with the following Performance Requirements:

1. Carpet Flammability
 - a. Methanamine Pill Test (DOC FF-1-70): Passes
 - b. Floor Radiant Panel (ASTM E-648): Class 1
 - c. Smoke Density (ASTM E-662): Less Than 350
2. Wearability: Lifetime Commercial Wear Warranty
3. Colorfastness Warranties: Lifetime Colorfastness to Light, Lifetime Colorfastness to Atmospheric Contaminants for 100% solution dyed nylon products.
4. Stain Removal: Lifetime Stain Removal Limited Guarantee
5. Edge Ravel/Zippering: Lifetime Warranties
6. Backing Integrity/Delamination: Lifetime Warranties
7. Traffic Class: Moderate or Heavy

1.4 SUBMITTALS

- A. Manufacturer's Data
Submit two (2) copies of manufacturer's specifications and installation instructions for carpet and related items specified.
- B. Fiber and Backing Verification
Submit certification from the fiber and backing producer verifying use of the branded fiber and backing in the submitted carpet product.
- C. Shop Drawings
For carpeted areas submit shop drawings showing installation of carpeting, seam diagram, pattern direction, necessary installation accessories, and provisions for work of other trades. Show location of different patterns or styles of carpet. Also, show locations of any threshold conditions.
- D. Samples: Submit standard-size carpet samples of each type of carpet, in each specified pattern, color, and construction.
 1. Any alternates to specified products must be submitted for approval by a representative of the end user or architect/design firm at least ten (10) working days prior to bid or proposal.

2. Final Sample Submittal
Submit two (2) sets of samples for each carpet type.
 3. No carpet shipments are permitted until acceptance of final samples is given by representative of the end user or architect/design firm, certifying that samples are the approved color, pattern, and texture.
- E. Indoor Air Quality Test Reports: Submit for specified products, indicating that the test results do not exceed the stated emission criteria of the CRI Indoor Air Quality Testing Program.
1. A representative from the carpet manufacturer shall meet with the contractor in the presence of a representative of the end user to review the recommended procedures, prior to occupancy of the finished spaces.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Include maintenance procedures, recommended cleaning and stain-removal materials, and recommended cleaning schedule. Include product data and Material Safety Data Sheets (MSDS) for cleaning and stain-removal materials.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver carpet in sealed protective rolls and accessories in sealed containers. Bind carpet materials with secure protective wrapping. Mark each carpet roll according to style, color, pattern, dye lot, run number, and quantity.
- B. Store products in an enclosed and dry area protected from damage and soiling.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install carpet until areas have been fully enclosed and environmental conditions have reached the levels indicated during occupancy.
- B. Maintain ambient temperature and humidity conditions during and after installation of broadloom carpet at levels indicated during occupancy.
- C. Allow carpet to reach room temperature or minimum

temperature recommended by manufacturer before beginning installation.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

1.9 SEQUENCING

- A. Sequence installation so as to minimize possibility of damage and soiling of carpet.
- B. Do not commence installation until painting and finishing work are complete, and ceiling and overhead work have been tested, approved, and completed.

1.10 WARRANTY

- A. Provide carpet manufacturer's 10 year warranty against defects in materials.
- B. Warranty: Include coverage for:
 - 1. Surface Wear: Not more than 10 percent by weight throughout life of product.
 - 2. Static: Maintain static generation at less than 3.5 kV at 70 degrees F, and 20 percent R.H. throughout life of product.
 - 3. No delamination throughout life of product.
 - 4. No edge ravel throughout life of product.
 - 5. Provide tuft bind consistent with industry standards.
 - 6. For High Performance broadloom: Ten year commercial. Warranty that owner will be completely satisfied with performance of carpet when installed in accordance with manufacturer's installation instructions and when maintained in accordance with current carpet care recommendations, and when such maintenance continues throughout duration of warranty period when owned and operated by original Owner.
 - 7. Provide carpet installer's one (1) year warranty against defects in installation.

2.0 PRODUCTS

2.1 BROADLOOM MANUFACTURERS

- A. Basis of Design:
Shaw Industries, Inc.

P.O. Drawer 2128
Dalton, Georgia 30722-2128

- B. Subject to compliance with requirements, provide broadloom carpet by one of the following:
1. Shaw Industries
 2. J & J Industries
 3. Lees Carpet, Mohawk Group

2.2 PRODUCT SPECIFICATIONS

A. Product	Shade Collection: Tint, Tone, or Gradient
B. Construction Type	Loop: Pattern, Graphic, or Multi-Level
C. Gauge	1/8
D. Stitches	10 per inch minimum
E Density	6,950 oz minimum
F. Yarn Weight	24 oz. minimum
G. Pile Thickness (ASIM D-418)	0.98 inches minimum
H. Backing Structure	Manufacturers standard
I. Width	12 feet
J. Base Color Method	Solution Dyed
K. Protective Treatment	Manufacturers standard soil treatment

2.3 ACCESSORIES

- A. Leveling Compound: Latex type as recommended by carpet manufacturer; compatible with carpet adhesive and curing/sealing compound used on concrete.
- B. Adhesive: Low VOC permanent carpet adhesive as recommended by carpet manufacturer for direct glue down of carpet; comply with CRI Green Label Certification Program. 3500 or 3600 with Florsept Anti-microbial Protection.
- C. Non-Metallic Carpet Edge Guard: Extruded or molded heavy-duty vinyl or rubber carpet edge guard of size and profile indicated; minimum two (2) inch wide anchorage flange; colors selected by Architect from manufacturer's standard range of colors.
- D. Miscellaneous Materials: As recommended by manufacturer

of carpet, cushion, and other carpeting products; as required to complete installation.

3.0 EXECUTION

3.1 EXAMINATION

- A. Exam substrates for conditions under which carpeting is to be installed.
- B. Verify that floor surfaces are smooth and flat within tolerances recommended by carpet manufacturer and are ready to receive work.
- C. Beginning of installation means installer accepts existing substrate conditions.

3.2 PREPARATION

- A. Allow new concrete to cure for 90 days before carpet installation starts.
- B. Perform moisture content testing as required by manufacturer's instructions to ensure pH readings of no more than nine (9). Moisture transmission of 5.5 lbs/sq ft per 24 hours is acceptable. If values exceed this level, follow manufacturer's recommendations for moisture transmission mitigation. Do not proceed until unsatisfactory conditions have been corrected.
- C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- D. Fill, level, and make smooth cracks 1/16 inch or more, holes, unevenness, and roughness with compatible latex floor patching compound. Feather floor filling or leveling compound a minimum of four (4) ft. Sweep floor of loose granular debris prior to filling. After filling, allow filler to dry. Damp mop floor with warm water and allow to dry. Vacuum after mopping to ensure that loose granular debris is removed and to provide a proper substrate to install broadloom carpet. Prohibit traffic until filler is cured.
- E. Vacuum floors again immediately before installation of carpeting.
- F. Confirm compatibility of adhesive with curing compounds on concrete floors.
- G. Preheat areas to receive carpet to a minimum temperature of 68 degrees F for 72 hours prior to installation, with a relative humidity of not more than 65 percent. Maintain

minimum temperature of 50 degrees F thereafter. Carpet and adhesive must be stored at a minimum temperature of 68 degrees F for 72 hours prior to installation.

3.3 INSTALLATION

- A. Install carpet in accordance with manufacturer's instructions and CRI 104, Section 8.
- B. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets in each space.
- C. Provide cutouts where required. Conceal cut edges with protective edge guards or flanges.
- D. Run carpet under open-bottom items and install tight against walls, columns, and cabinets so that the entire floor area is covered with carpet. Cover over floor-type door closers.
- E. Install edging guard at openings and doors wherever carpet terminates, unless indicated otherwise.
- F. Perform cutting in accordance with manufacturer's recommendation using tools designed for carpet being installed. Verify carpet match before cutting to ensure minimal variation between dye lots.
- G. Install carpet from same dye lot and run within each continuous carpet area.
- H. Seal seams with manufacturer recommended seam sealer, if applicable.
- I. Install carpet with pile-lay in same direction except when indicated otherwise on drawings.
- J. Use leveling compound where necessary. Feather floor leveling compound minimum of 4 ft.
- K. Do not bridge building expansion joints with continuous carpeting. Provide for movement.
- L. Apply seam adhesive to base of edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- M. Roll with appropriate roller for complete contact of adhesive to carpet backing.

- N. Trim carpet neatly at walls and around interruptions.
- O. Complete installation of edge strips, concealing exposed edges.
- P. Cut carpet at fixtures, architectural elements, and perimeters.
- Q. Use a fixed reducer strip to secure broadloom area in open perimeter designs.
- R. Install carpet on stairs using an environmentally acceptable permanent adhesive. Furnish and install compatible edge trim and nosing products as required.

3.4 FIELD QUALITY CONTROL

- A. Inspect completed carpet installation on each floor.
- B. Verify that installation is complete; work is properly done and acceptable.
- C. Remove and replace, at no additional cost to owner, any work found not to be acceptable.

3.5 CLEANING

- A. On completion of installation in each area, remove dirt and carpet scraps from surface of carpet. Remove soiling, spots, or excess adhesive on carpet with cleaning materials recommended by carpet manufacturer.
- B. At completion of work, vacuum carpet using commercial vacuuming equipment as recommended by carpet manufacturer. Remove spots and replace carpet where spots cannot be removed. Remove rejected carpeting and replace with new carpeting. Remove any protruding yarns with shears or sharp scissors.

3.6 PROTECTION

- A. Do not permit traffic over unprotected floor surface.
- B. Protect carpet against damage during construction. Cover with 6-mil thick polyethylene covering with taped joints during construction period whenever protection is required, so that carpet will be without any indication of deterioration, wear, or damage at time of completion.
- C. Maintain protection of carpeting on each floor or area until work is accepted.

END OF SECTION

SECTION 099100 – PAINTING

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 surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from paint manufacturer's standard colors and finishes available.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5.
1. The Architect will select one room surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. of wall surface.
 - b. Small Areas and Items: The Architect will designate an item or area as required.
 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
- C. Do not apply paint in rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Unless otherwise specified, paint materials and systems specified herein are those of Porter Paint Co. (Porter). Subject to compliance with requirements, equivalent materials and systems by one of the following manufacturers are also acceptable:
 - 1. Porter and/or Pittsburg Paints
 - 2. Benjamin Moore and Co.
 - 3. Sherwin Williams

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: Provide color selections made by the Architect.

2.3 LEAD CONTENT

- A. The paint shall comply with the latest requirements of the Federal Government for maximum allowable lead content. Such compliance shall be stated on the MSDS and container clearly identifying the product.

2.4 VOC COMPLIANCE

- A. The paint shall comply with the latest requirements of Federal, Florida State, City or Local Government requirements for the maximum allowable VOC content at the time of purchase. Such compliance shall be stated on the MSDS and container clearly identifying the product.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete and concrete masonry surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

- a. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
- 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the schedule.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 - 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured

- as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions. All metal surfaces shall be sprayed except that piping, conduit, and ductwork may be brushed or rolled.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Electrical items to be painted include, but are not limited to, the following:
1. Exposed conduit and fittings.
 2. Exterior switchgear.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
 - 3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE (AND SUPPLEMENTAL PREPARATION REQUIREMENTS WHERE INCLUDED)

A. General: Provide the following paint systems for the various substrates, as indicated.

1. Exterior and Interior Hollow Metal Doors, Door Frames, and Window Frames: Semi-Gloss Acrylic Enamel Finish.
 - a. Prime Coat: Spot Prime Scratched or Abraded Areas Only – Rust Inhibitive Alkyd Metal Primer.
 - 1) PPG: 90-912 Pitt-Tech -Plus Interior/Exterior Primer Finish DTM Industrial Enamel.
 - b. First and Second Finish Coats: Semi-Gloss Acrylic Enamel.
 - 1) PPG Pittsburgh Paints: 90-1210 Pitt-Tech Plus DTM 100% Acrylic interior/Exterior Semi-Gloss Acrylic Enamel
2. Interior Pipe Columns at Fitness 130 and Fitness Loft 201, Elevator Door and Frame at exterior side, and Railings at Open Monumental Stair and Fitness Loft 201.
 - a. Preparation: Prepare surface per SSPC SP-6 “commercial blast” minimum. Surface profile shall be 2.0 – 2.5 mils.
 - b. Prime Coat:
 - 1) PPG 97-694 Metalhide 2000 Inorganic Zinc Rich Coating @ 2.0-5.0 Mils DFT.
 - c. Touch-up: For field touch up over Inorganic Zinc coated steel
 - 1) PPG Coraflon ADS 570 ABZ Zinc Rich Epoxy Primer @ 3.0-4.0 Mils DFT making sure the IOZ coated steel is clean, dry, and free of contamination. If necessary, solvent clean per SSPC SP-1 to remove any contamination that may be present.
 - d. First Finish Coat: Satin Sheen, color to be selected from the complete “Mica” range of colors.
 - 1) PPG Coraflon ADS Epoxy Primer/Intermediate ADS573/ADS574 @ 3.0-5.0 Mils DFT. A mist coat may be necessary to eliminate bubbling. Allow the primer to cure 6 to 8 hours before top coating.
 - e. Second Finish Coat: Satin Sheen, color to be selected from the complete “Mica” range of colors.
 - 1) PPG Coraflon ADS @ 1.5 to 2.0 DFT per instructions on the manufacturers technical data bulletin.
3. Interior Steel Stairs, Steel Railings except where indicated otherwise, Steel Break Metal Trim, and exposed Structural Steel except at exposed roof structure at Fitness 130 and Fitness Loft 201
 - a. Prime Coat - Acrylic Enamel

- 1) PPG; 90-712 Pitt-Tech Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
- b. First and Second Finish Coats: Satin Acrylic Enamel
 - 1) PPG; 90-474 Series Pitt-Tech Interior/Exterior Satin DTM Industrial Enamels: Applied at a dry film thickness of not less than 2.0 mils (0.050 mm).
4. Interior New Concrete Block: Semi-Gloss Acrylic Epoxy. Contractor shall confirm sheen of existing painted block and modify product indicated if sheen indicated does not match existing condition.
 - a. Prime Coat: Block Filler.
 - 1) PPG: 6-15 Speedhide Acrylic Block Filler.
 - b. First and Second Finish Coats: Semi-Gloss Acrylic Epoxy.
 - 1) PPG: 16-510 Pitt-Glaze WB 1 Acrylic Epoxy.
5. Interior Concrete Block: Previously Painted - Semi-Gloss Acrylic Epoxy. Contractor shall confirm sheen of existing painted block and modify product indicated if sheen indicated does not match existing condition.
 - a. First and Second Finish Coats: Semi-Gloss Acrylic Epoxy.
 - 1) PPG: 16-510 Pitt-Glaze WB 1 Acrylic Epoxy
6. Interior New Gypsum Board Walls for Observation 210 and Restroom 108; Semi-Gloss Acrylic Epoxy Paint.
 - a. Prime Coat: Latex Primer Sealer.
 - 1) PPG: 6-2 Speedhide Latex Sealer.
 - b. First and Second Finish Coats: Semi-Gloss Acrylic Epoxy.
 - 1) PPG: 16-510 Pitt-Glaze WB 1 Acrylic Epoxy
7. Interior New Gypsum Board Walls typical unless otherwise indicated; Satin Acrylic Paint.
 - a. Prime Coat: Latex Sealer
 - 1) PPG: 6-2 Speedhide Latex Sealer.
 - b. First and Second Finish Coats: Satin Acrylic Paint.
 - 1) PPG: 6-3511 Series Speedhide Interior Satin Latex
8. Interior New Gypsum Board Ceilings; Eggshell Acrylic Latex Paint.
 - a. Prime Coat: Latex Sealer

- 1) PPG: 6-2 Speedhide Latex Sealer.
- b. First and Second Finish Coats: Eggshell Acrylic Latex Paint.
 - 1) PPG: 6-4310 Speedhide Zero VOC Eggshell Acrylic Latex.
9. Interior Open Ceilings (where scheduled for Dry Fog), structure and all other items above elevation indicated unless specifically indicated otherwise; Flat Black
 - a. Preparation; remove all dust and dirt to leave a clean dry surface.
 - b. Paint:
 - 1) 1 Coat; PPG Speedhide 6-713XI Interior WB Acrylic Dry-Fog Flat Latex; Flat Black
10. Painted ductwork, where indicated on drawings.
 - a. As recommended by manufacturer for application indicated.
11. Concrete Floor: Areas to be sealed.
 - c. Seal
 - a. 1 Coat; PPG Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer

END OF SECTION

SECTION 101400 – SIGNAGE

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 the following:

- 1. Panel signs.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Melamine Sheet: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

1.4 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. All signs shall conform to all requirements of the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities, Articles 4.1.2 (7) and 4.30.1 through 4.30.7 (1) inclusive.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Manufacturers of Panel Signs:
 - a. Ace Sign Systems, Inc.
 - b. Allen Industries, Inc.
 - c. ASI-Modulex, Inc.
 - d. Best Sign Systems, Inc.
 - e. Designed Signs Clearwater, Inc.
 - f. Environmental Graphics, Inc.
 - g. Mohawk Sign Systems

2.2 PANEL SIGNS FOR ROOM IDENTIFICATION

- A. General: Panel signs shall be minimum 1/8" thick (excluding thickness of raised sign letters) melamine or acrylic plastic with 1/32" thick raised characters with Grade 2 Braille.
 - 1. At sign manufacturer's option, the minimum 1/8" thickness of the panel can be achieved by laminating a base layer of melamine or acrylic to the top layer containing the integral raised characters. Edges shall be ground smooth.
 - 2. The characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with the background – either light characters on a dark background or dark characters on a light background. Submit manufacturer's standard palette of colors meeting these requirements to Architect for selection.
 - 3. Raised Tactile Text shall be achieved by chemically welding 1/16" thick computer cut, colorfast MAP text characters into the 1/32" computer recessed area of the face of the base sheet. The text shall be chemically welded to the recessed surface of the base sheet using methylene chloride and shall, after fabrication, remain raised 1/32" above the face of the base sheet.
 - 4. Grade 2 Braille shall be achieved by pressing optically correct acrylic raster balls into .003 in. computer drilled holes in the base sheet surface. The acrylic raster balls shall be U.V. protected and shall be guaranteed against fading. Bordered, depressed Braille is not acceptable.
 - 5. Sign edges shall be square and the corners shall have a 1/4" radius unless otherwise indicated in drawing details.
 - 6. Text style shall be Helvetica upper and lower case letters. Text height shall be determined within a range of 5/8" to 2".

- B. Room identification signs are to be provided at the following locations and as indicated on the project drawings.
 - 1. At all Toilet Rooms, in addition to a room name sign provide pictograms of the international symbol of accessibility.
 - a. Example:
 - 1) Room Name Sign: Men's Restroom
 - 2) Pictogram: Accessibility Symbol
 - 2. Fabrication: The sign shall match existing. Sign edges are to be straight and free from saw marks or any other imperfections. Corners shall be rounded, with 1/4" to 3/8" radius.
- C. Maximum Occupants signs:
 - 1. Design, locations, and text as indicated on the drawings.

Part 3 – EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Room Identification Signs: Mount on adjoining walls and locate signs adjacent to the latch side of the door. In case of conflicts with closely spaced doors, with vision panels or where there is no wall space to the latch side of the door, notify Architect. Verify all sign locations with Architect prior to installation.
- C. Wall Mounted Signs: Attach signs to wall surfaces using a minimum of two stainless steel screws. For exterior signs, use four stainless steel screws. Use expansion shields for screws set in masonry; use "Molly" type hollow wall fasteners for screws set in gypsum board or plaster.
 - 1. Mounting shall be at a height of 60" to the centerline of the sign (to centerline of top sign when two signs are mounted one above the other).

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instruction. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 101550 - TOILET COMPARTMENTS

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 solid-polymer units as follows:
 - 1. Toilet Enclosures: Overhead braced (floor mounted).
 - 2. Urinal Screens: Wall hung.
- B. Related Sections include the following:
 - 1. Division 6 Section "Miscellaneous Carpentry".
 - 2. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: For each type of unit indicated.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 SOLID-POLYMER UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Accurate Partitions Corporation.
 - 2. Ampco.
 - 3. Bradley Corporation; Mills Partitions.
 - 4. General Partitions Mfg. Corp.
 - 5. Global Steel Products Corp.
 - 6. Metpar Corp.
 - 7. Santana Products, Inc.
 - 8. Sanymetal; a Crane Plumbing Company.
 - 9. Weis-Robart Partitions, Inc.
- B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.
- C. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- D. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.
- E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2.2 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design (except where otherwise indicated), heavy-duty operating hardware and accessories.
 - 1. Material: Stainless steel.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make

provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

- B. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.
 - 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 - 2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
 - 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 - 4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 - 5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 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 (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less 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.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to 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

SECTION 102800 - TOILET ACCESSORIES

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 toilet and bath accessory items as shown on the drawings.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Specifications are based upon products by Bobrick Washroom Equipment, Inc. unless noted otherwise. Refer to model numbers on drawings. Subject to compliance with requirements, equivalent toilet accessories by one of the following manufacturers are also acceptable:
 - 1. Bobrick
 - 2. ASI - American Specialties Inc.
 - 3. Bradley

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch minimum thickness.

- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16 (ASTM B 16M); Castings, ASTM B 30.
- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366 (ASTM A 366M), 0.04 inch minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527 G60 (ASTM A 527M Z180).
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- F. Mirror Glass: Fully tempered glass, nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
- G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 FABRICATION

- A. General: Only a maximum 1-1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:
 - 1. Provide galvanized-steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:
 - 1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 104415 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
- C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. J.L. Industries.
 - 2. Larsen's Manufacturing Co.
 - 3. Modern Metal Products by Muckle.
 - 4. Potter-Roemer, Inc.
 - 5. Samson Metal Products, Inc.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

- B. Multipurpose Dry Chemical Type: UL-rated 2-A:10:B:C, 5-lb nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall, structure, or to inside of cabinet. Provide of sizes required for types of fire extinguishers and mounting condition indicated, with plated or baked-enamel finish.
 - 1. Color: Red.

2.3 CABINETS

- A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed. Provide wherever cabinet is to be installed in a fire-rated wall or partition.
- C. Cabinet Type: Suitable for containing the following
 - 1. Fire extinguisher.
- D. Cabinet Material:
 - 1. Cold rolled sheet steel with baked enamel or powder coat finish at semi-recessed cabinets
 - 2. Material to match door trim at surface mounted cabinets.
- E. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth. One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide at all locations except where surface mounted is specifically indicated
 - 2. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim. Provide where a cabinet is indicated at an exterior wall location on the drawings.
- F. Cabinet Trim Material: Aluminum sheet or extruded-aluminum shapes with clear anodized finish.
- G. Door Material: Aluminum sheet or extruded-aluminum shapes with clear anodized finish.
 - 1. Door Glazing: Fully tempered float glass complying with ASTM C 1048, Condition A, Type I, Quality q3, Kind FT, Class as follows:
 - . Class 1 (clear).
 - 1. Manufacturers standard Full-Glass Panel: Tempered glass, 1/8 inch thick.
- H. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

- I. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations indicated. Mount cabinet with bottom edge of trim located 32" above finished floor.
 1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions. Recesses in masonry walls shall be neatly sawcut.
 2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION

SECTION 107110 - SUNSHADES

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 sunshades.
- B. Related Requirements:
 - 1. Division 7 Section "Sheet Metal Flashing and Trim" for aluminum sheet fascia panels.
 - 2. Section Division 8 Section "Glazed Aluminum Curtainwall" for coordination with sunshade support brackets to be provided under the work of the curtainwall fabricator.

1.3 COORDINATION

- A. Coordinate sunshades with curtainwall shop drawings. Brackets for support of sunshades are to be shown on curtainwall shop drawings.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for sunshades.
 - 1. Include plans, elevations, component details, and attachment details.
 - 2. Indicate materials, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- C. Samples for Verification: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.
- D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, registered in the state of Florida, responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications 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.
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build mockup to set quality standards for fabrication and installation.
 - 1. Install one section of sunshade at location indicated on project architectural drawings. Do not proceed with installation of any other sunshades until the mock-up section has been reviewed and approved by the architect and the owner's representative.
 - 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 actual locations of curtainwall elements and other construction contiguous with sunshades by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to provide structural design for sunshades.
- B. Structural Performance: Sunshades, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:
 - 1. Wind Loads on Exterior Items: As indicated on project Structural drawings.
- C. 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

- A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

- B. Aluminum Sheet: Flat sheet complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.
- C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- D. Fasteners: Stainless Steel.
 - 1. Provide concealed fasteners for interconnecting metal parts and for attaching them to other work unless otherwise indicated or where exposed fasteners are unavoidable.
 - 2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

2.3 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble sunshades in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of sunshades with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. 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 metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends
- F. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- G. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce metal items as needed to attach and support other construction.
- H. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.4 SUNSHADES

- A. Form closures and trim from metal of type and thickness indicated on project drawings unless greater thickness or profile is required for structural reasons.
 - 1. Aluminum Sheet: 0.080.

- a. Finish: Mill finish then machine buffed and polished to match sheen of sunshades and fascia trim on existing parts of the building.

2. Extruded aluminum angles and plates

- B. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.
- C. Drill and tap holes needed for securing closures and trim to other surfaces.
- D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.
- E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.5 GENERAL FINISH REQUIREMENTS

- A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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 sunshades.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place sunshades level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required for installation.
 - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Form tight joints with exposed connections accurately fitted together.

3.3 ADJUSTING AND CLEANING

- A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 126000 – CEILING FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

The facility will be equipped with Big Ass Fans, Model P8 fan, mounting hardware and variable speed fan controls as manufactured by Big Ass Fan Co.

1.2 RELATED WORK

Installation of the fans, miscellaneous or structural metal work, if required field electrical wiring, wire, conduit, fuses, and disconnect switches other than those included within the control panels manufactured by Big Ass Fans are in the Scope of Work of other divisions or trades.

PART 1. PRODUCT

2.1 COMPLETE UNIT

The fan shall be designed to move the maximum amount of free air contained within a given space with the least amount of electrical power. Free air is defined as that air within a given space at a constant static pressure.

1. The power supply for Model P14 shall be one (1) horsepower or 0.75 kW, regardless of the air movement provided.
2. The Bis Ass Fan logo will not be displayed on the unit or control boxes. The initials B.A.F. are acceptable.

2.2 AIRFOILS

Each fan shall have ten (10) low speed airfoils of precision extruded 6063 aluminum alloy, weighing no more than 1.59 pounds per foot of length. All airfoils shall be heat treated for strength. Each airfoil will be of the high performance PowerFoil™ (patent pending) design. The foils shall be connected to the hub section of the fan by means of 2 locking bolts per foil, providing no less than 16,000 pounds shear strength. Additionally, the airfoils shall be interlocked with a Safety strap 14 galvanized A36 Steel to prevent an individual airfoil from becoming accidentally disconnected from the hub.

2.3 WINGLET

Winglets are to be affixed to the tip of each foil by means of a ¼" stainless steel pillar screw. Each winglet shall be safety yellow in color nominally measuring 9" x 3 ½" and made of a shatter resistant High Density Polyethylene.

2.4 MOTOR

The fan motor shall be 1730 RPM, 220-277/380-480 Volts AC, 60 Hz, 3 Phase, Inverter rated with Class F Insulation, 40°C Ambient-Continuous, Thermal Protection 150°C. According to the specifying fan model number, the motor will be:

1. Models P14 shall be one (1) horsepower or 0.75 kW

2.5 GEAR REDUCER

The gear reducer shall be a C-Style MGS Helical Gear Reducer or equivalent hardened to 58-62 Rockwell C. The gear reducer shall be precision finished for low noise and long service life with double lip seals keep oil in and contaminants out, and be lubricated for life. The gear reducer shall have a standard backlash of less than 20 arc minutes and be equipped with a 17-4 Stainless Steel shaft of 1.25" diameter conditioned to 1150.

2.6 MOTOR FRAME

The fan motor frame and mount shall be constructed of ¼" powder-coated steel. The mount shall be designed to allow safety cables to be easily and securely attached.

2.7 HUB

The fan hub assembly shall be constructed of a precision cast of prime 713 aluminum alloy or equivalent. The hub shall incorporate six (6) safety clips made of ¼" steel that will brake the motor in case of shaft failure.

2.8 MOUNT

The fan mount shall be designed for quick and secure mounting of the fan from a structure's support beams. The mounting system of the fan shall allow easy removal and relocation, if required. The fan mount shall be lightweight and constructed of ¼" powder coated steel.

2.9 SAFETY WIRE ROPE

The safety wire rope shall consist of a 7 x 19 class stranded galvanized steel of 1/4 inch diameter with 4 clamps to secure the motor frame to the structural member from which the fan is attached. The safety wire rope shall have a breaking strength of not less than 7,000 pounds.

2.10 FAN CONTROLLER

Each fan controller will be UL listed as Enclosed Industrial Control Panels and built pursuant to construction guidelines set forth by Underwriters Laboratories article 508A, and the National Electrical Code.

Each fan controller will include a factory programmed Variable Frequency Drive (VFD) to provide a soft-start for the fan as well as infinite speed control capability for the fan(s). The VFD will be sized per the motor's maximum current requirements under locked rotor torque demands. When more than one fan motor is controlled by a VFD, the size of the VFD will be based on the maximum current requirements of the total peak currents of all motor loads under the worst operating conditions. Multiple motor systems will also include a Solid State Overload relay for each motor.

Each fan controller built for 480 volt power will be equipped with a properly rated load reactor for handling voltage irregularities. Load reactors shall be of minimum 3% impedance per unit and shall be provided integral to the VFD as a part of the fan controller package.

Each fan controller will be equipped with an ON/OFF switch, speed control potentiometer, safety disconnect, and properly sized fuse block. The controls shall be housed in a NEMA Type 1 enclosure to prevent accidental contact with the enclosed equipment, and to exclude entry of unwanted substances.

2.11 FAN CONTROLLER PROGRAM

The controller shall be factory programmed to minimize the starting torque of the fan to approximately 15 foot pounds. This will extend the operating life of the fan by minimizing the stress on all components. Additionally, the controller will allow the speed of the fan to be altered easily to optimize the fans use in any conditions.

2. ANCILLARY

3.1 WORKMANSHIP

Good workmanship shall be evident in all aspects of the construction of the fan. No "balancing" of the foils shall be necessary. All welding joints shall be filleted.

3.2 DOCUMENTATION

The manufacturer will furnish a copy of all operating and maintenance instructions for the Big Ass fan.

3.3 WARRANTY

The manufacturer shall warrant the Big Ass Fan and components against defects in materials and workmanship pursuant to the following schedule:

Airfoils	Lifetime (Parts)
Hub	Lifetime (Parts)
Motor	3 years (Parts)
Controller Components	3 years (Parts)
Labor	1 year

Further information on the terms and conditions of the warranties can be found in the User's Guide supplied with each fan.

SECTION 133420 - METAL BUILDING SYSTEMS SUPPLEMENTAL

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. This section supplements Section 133419 – Metal Building Systems.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal roof panels.
 - 2. Metal wall panels.
 - 3. Thermal insulation for metal building system.
 - 4. Accessories.

1.3 QUALITY ASSURANCE

- A. Refer to Section 133419

1.4 COORDINATION

- A. At some locations, indicated on the drawings, the intent is to align with or match the existing pre-engineered metal building elements. Where matching or aligning is indicated, it is the manufacturer's responsibility to field verify locations and dimensions of the existing elements.
- B. Coordinate installation of equipment supports and roof penetrations, which are shown on other contract documents.
- C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL ROOF PANELS

A. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.

1. Basis of design is USA Supreme-Lok panel. Refer to Section 133419 for other acceptable manufacturers subject to below requirements
2. Material: Aluminum-zinc alloy-coated steel sheet, 0.028-inch nominal thickness.
3. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from aluminum-zinc alloy-coated steel, or stainless-steel sheet.
4. Joint Type: Mechanically seamed, folded according to manufacturer's standard.
5. Panel Coverage: 16 inches.
6. Panel Height: 2 inches.
7. Uplift Rating: Refer to Section 133419.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process.
 - a. Galvalume finish.
 - b. Surface: Smooth, flat finish.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal ribs and flat pan between ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Basis of design is MBCI 7.2 Panel to match existing.
2. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch (0.71-mm) nominal thickness.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: To match existing. It is our understanding the existing color is Colonial Red which would need to be confirmed by physical samples.

3. Major-Rib Spacing: 7.2 inches o.c.
4. Panel Coverage: 36 inches.
5. Panel Height: 1.5 inches.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - b. Surface: Smooth, flat finish.

C. Finishes:

1. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 THERMAL INSULATION

- A. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
 1. Insulation thickness:
 - a. Minimum 4 inch at walls
 - b. Minimum 6 inch at roof
 2. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method.
 - a. Composition: White polypropylene film facing, fiberglass scrim reinforcement, and metallized-polyester film backing.
- B. Retainer Strips: 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.4 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent

possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
- E. Gutters: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match wall color and rake trim. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual" but in no case smaller than existing adjacent gutters.
1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from 0.022-inch (0.56-mm) nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.

- G. Roof Curbs: Fabricated from minimum 0.052-inch (1.32-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.
 - 1. Curb Subframing: Fabricated from 0.064-inch (1.63-mm) nominal-thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
- H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- I. Materials:
 - 1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
 - b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws.
 - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 - 2. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

PART 3 - EXECUTION

3.1 METAL PANEL INSTALLATION, GENERAL

- A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- ### 3.2 METAL ROOF PANEL INSTALLATION
- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
5. Provide metal closures at peaks, rake edges, and each side of ridge caps.

3.3 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings.
 1. Where a vertical installation is indicated, install panels perpendicular to girts, extending full height of building, unless otherwise indicated.
 2. Where a horizontal application is indicated, install the panels to vertical sub-framing members which are attached to the girts. Space the sub-framing members to comply with structural requirements of Section 133419, the panel manufacturer's recommendations, and at panel laps.
 3. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 4. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 5. Shim or otherwise plumb substrates receiving metal wall panels.
 6. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
 7. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 8. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
 9. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 10. Install screw fasteners in predrilled holes.
 11. Install flashing and trim as metal wall panel work proceeds.
 12. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
 13. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
 14. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

3.4 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions. Install per manufacturers installation recommendations.
- B. Blanket Roof Insulation: Comply with the following installation method:
 1. Match existing adjacent installation technique.
 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

- C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.
 - 1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Tie downspouts to underground drainage system indicated.

- E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.6 CLEANING AND PROTECTION

- A. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 142100 - ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric Traction Elevators.
- B. Products Supplied But Not Installed Under this Section:
 - 1. Hoist Beam
 - 2. Inserts mounted in block walls for rail attachments
- C. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
 - 8. Access Doors: As required for access to governor. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.
- D. Industry and government standards:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. Color selection charts for cab and entrances.
- B. Shop Drawings:
 - 1. Clearances and travel of car.

2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and signals.
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements.
8. Location and sizes of access doors.
9. Location and details of hoistway door and frames.
10. Electrical characteristics and connection requirements.

C. Operation and maintenance data:

1. Provide manufacturer's standard maintenance and operation manual.

D. Diagnostic Tools

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- B. Installer: The equipment manufacturer shall install the elevator.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations.

1.05 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.06 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 Months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
 - 1. Basis of Design: EcoSpace traction elevators by KONE, Inc.
 - 2. Other acceptable machine room-less products: manufacturer with minimum 15 years experience in manufacturing, installing, and servicing elevators of the type required for the project. Other manufacturers shall be subject to approval by architect as equal to basis of design. Submittal of relevant information shall be made by any proposed manufacturer to the architect for review.

2.02 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment: KONE EcoSpace gearless traction elevator
- B. Equipment Control: KCM831
- C. Drive: Non-Regenerative
- D. Quantity of Elevators: 1

- E. Landings: 2
- F. Openings: 2 Front Openings, 0 Back Openings
- G. Travel: 14'-0"
- H. Rated Capacity: 2500 lbs (1134 kg)
- I. Rated Speed: 150 fpm
- J. Clear Inside Dimensions (W x D): 6'-8" x 4'-3"
- K. Cab Height: 8'
- L. Clear height under suspended ceiling: 7'-7"
- M. Entrance Width & Type: 3'-6" & Right Opening
- N. Entrance Height: 7'
- O. Main Power Supply: 208 Volts + 5%, three-phase
- P. Operation: Simplex
- Q. Machine Location: Inside the hoistway mounted on car guide rail
- R. Control Space Location: Adjacent Room
- S. Elevator Equipment shall conform to the requirements of seismic zone: Non-Seismic
- T. Maintenance Service Period: 12 Months

2.03 PERFORMANCE REQUIREMENTS

A. Car Performance

1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance

1. Vertical Vibration (maximum): 25 mg
2. Horizontal Vibration (maximum): 25 mg
3. Jerk Rate (maximum): 1.3 ft/sec³
4. Acceleration (maximum) 1.3 ft/sec²
5. In Car Noise: = 55 dB(A)
6. Leveling Accuracy: \pm 0.2 inches
7. Starts per hour (maximum): 120

2.04 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Control Space: Locate controller{s} in a room adjacent to the hoistway at location shown on the project architectural drawings.

2.05 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- D. Hoistway Operating Devices:
1. Emergency stop switch in the pit
 2. Terminal stopping switches.
 3. Emergency stop switch on the machine
- E. Positioning System: System consisting of magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.06 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
1. Sills: extruded.
 2. Doors: Hollow metal construction with vertical internal channel reinforcements.
 3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
 4. Entrance Finish: Painted Finish.
 5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.07 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

- B. Platform: Platform shall be per manufacturers standard.
- C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Load weighing device shall be strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.
- E. Steel Cab
 - 1. Panels: Non-removable vertical panels, plastic laminate selected by the architect from the product line of one of the major manufacturers (Pionite, Formica, Nevamar, or Wilsonart).
 - 2. Car Front Finish: Brushed stainless steel.
 - 3. Car Door Finish: Brushed stainless steel.
 - 4. Ceiling:
 - a. Round LED Down Light Drop Ceiling - LF-88: Satin Finished Stainless Steel three panel suspended ceiling with two holes per panel for Round LED lights.
 - 5. Handrail:
 - a. Custom Flat - satin stainless steel - 2 in. wide. Rails to be located on Back Wall of car enclosure.
 - 6. Flooring: By others. (Not to exceed 2 sq. ft. & 1/2" finished depth.)
 - 7. Threshold: Aluminum
 - 8. Protective pad hooks and quilted fire retardant protective pads: Pad to be hung from suspended ceiling
- F. Emergency Car Signals
 - 1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
 - 2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
 - 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- G. Ventilation: Fan.

2.08 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
 - 1. Car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be a 7-segment amber display. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.
 - 2. Additional features of car operating panel shall include:

- a. Car Position Indicator within operating panel (amber).
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Firefighter's hat.
 - f. Firefighter's Phase II Key-switch.
 - g. Call Cancel Button.
 - h. Pre-programmed integrated ADA phone (complete description of krms features included as standard)
 - i. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - j. Firefighter's Phase II emergency in-car operating instructions.
- B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.
- 1. Hall fixtures shall feature round, mechanical, illuminated buttons in raised fixture housings. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. Hall fixtures should not be jamb-mounted. Hall lanterns shall feature amber illumination.
- C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

2.09 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

- A. Elevator Operation
- 1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
 - 2. Zoned Car Parking.
 - 3. Relative System Response Dispatching.
- B. Standard Operating Features to include:
- 1. Full Collective Operation
 - 2. Fan and Light Control.
 - 3. Load Weighing Bypass.
 - 4. Ascending Car Uncontrolled Movement Protection
 - 5. Top of Car Inspection Station.
- C. Additional Operating Features to include:
- D. Elevator Control System for Inspections and Emergency
- 1. Provide devices within controller to run the elevator in inspection operation.
 - 2. Provide devices on car top to run the elevator in inspection operation.

3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.10 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected.
- C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

- D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.04 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.

- c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
- d. Coordinate interface of elevators and fire alarm system.
- e. Coordinate interface of dedicated telephone line.

3.05 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain required permits and provide originals to Owner's Representative.

3.06 DEMONSTRATION

- A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION

SECTION 21 05 00 - BASIC FIRE PROTECTION REQUIREMENTS

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 SUMMARY

- A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 21. It expands and supplements the requirements specified in sections of Division 1.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

1.4 FIRE PROTECTION INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- B. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- C. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.
- D. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Separate divisional drawings and specifications shall not relieve the Contractor from full responsibility to complete all work which may be indicated on any of the drawings or in any division of the specification.
- B. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work.
- C. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for a complete installation are excluded.
- D. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.
- E. Examine the architectural, structural, electrical and mechanical drawings and specifications prior to submitting bid. Architectural and structural drawings take precedence over mechanical drawings with reference to building construction, location of risers, and any other similar fixed items.
- F. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences which occur between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

1.6 CUTTING AND PATCHING

- A. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Do not cut structural members without prior written approval of the structural Engineer or Architect.
- B. Arrange for repairs required to restore other work, because of damage caused as a result of fire protection installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- C. Perform cutting, fitting, and patching of equipment and materials required to: uncover Work to provide for installation of ill-timed Work; remove and replace defective Work; remove samples of installed Work as specified for testing; install equipment and materials in existing structures; upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- D. Cut, remove and legally dispose of selected fire protection equipment, components, and materials as indicated, including, but not limited to removal of piping, compressors, sprinklers and trim, and other items made obsolete by the new Work.
- E. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

- F. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to change over.

1.7 FIRE PROTECTION SUBMITTALS

- A. Refer to the Conditions of the Contract (General and Supplementary), Division 1 and Division 21 Section: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal definitions, requirements, and procedures. Submittal of shop drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.

1.8 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders, Division 1 and Division 21 Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.9 PRODUCT LISTING

- A. Prepare listing of major fire protection equipment and materials for the project. Submit this listing as a part of the submittal requirement specified.

1.10 PRODUCTS

- A. When two or more items of same material or equipment are required (sprinklers, pumps, valves, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.

1.11 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications: adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

1.13 RECORD DOCUMENTS

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 1.
- B. Mark drawings to indicate revisions to piping, size and location both exterior and interior: including locations of valves and other control devices, compressors and similar units requiring periodic maintenance or repair: actual equipment locations, dimensioned from column lines: actual inverts and locations of underground piping: concealed equipment, dimensioned to column lines: mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., fire protection devices, expansion compensators, tanks, etc.): Change Orders: concealed control system devices.
- C. Mark specifications to indicate approved substitutions: Change Orders; actual equipment and materials used.
- D. Reproducible record drawings shall be on bond paper, of the same size sheets as the contract documents.

1.14 OPERATION AND MAINTENANCE DATA

- A. In addition to the information required by Division 1 for Maintenance Data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions: regulation, control, stopping, shut-down, and emergency instructions: and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting: disassembly, repair, and reassembly: aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.15 WARRANTIES

- A. Refer to the Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division 21, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond: duration of warranty or bond: and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.16 CLEANING

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

1.17 FIRE PROTECTION WORKING

- A. Prepare and submit a set of working plans in accordance with NFPA 13(Chapter 22) showing major elements, components, piping, and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/8"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining equipment, valve stem movement, and similar requirements.
- B. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work.
- C. If the contractor's working plans deviate significantly from the engineer's plans, the contractor shall employ the services of a licensed professional engineer to sign and seal the working plans and hydraulic calculations and become the delegate engineer.

END OF SECTION

SECTION 21 13 13 - FIRE PROTECTION

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 this Section.

1.2 SUMMARY

- A. This Section specifies automatic sprinkler systems and standpipe and hose systems for buildings and structures. Materials and equipment specified in this Section include pipe, fittings, valves, and specialties; sprinklers and accessories.
- B. Products furnished but not installed include sprinkler cabinet with spare sprinklers. Furnish to the Owner's maintenance personnel.

1.3 DEFINITIONS

- A. Pipe sizes used in this specification are nominal pipe size (IPS).
- B. Other definitions for fire protection systems are listed in NFPA Standards 13, 14, and 24.
- C. Working Plans as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the authority having jurisdiction.

1.4 SYSTEM DESCRIPTION

- A. Fire protection system is a "Wet-Pipe" system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by fire.

1.5 SUBMITTALS

- A. Product Data: Include each type of sprinkler, valve, piping specialty, fire protection specialty, fire department connection specified.
- B. Shop Drawings: Submit drawings which have been prepared in accordance with NFPA 13 identified as "Working Plans," and which have been approved by the authority having jurisdiction. Where the engineer has performed the hydraulic calculations and provided drawings with pipe routing and sizing, the contractor must install the system as designed. Any major rerouting or resizing of piping must be approved by the engineer prior to installation. Any system redesign costs, incurred by the engineer, will be the responsibility of the contractor.
- C. Coordination Drawings: Detail fire protection piping systems in accordance with Division 23 Section "Basic Mechanical Requirements".

- D. Maintenance Data: For each type sprinkler, valve, piping specialty, fire protection specialty, fire department connection specified, for inclusion in operating and maintenance manual specified in Division 1 and Division 21 Section "Basic Fire Protection Requirements".
- E. Quality Control Submittals: Test Reports and Certificates: Include "Contractor's Material & Test Certificate for Above Ground Piping" and "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA 13.
- F. Fire protection products shall be shown on drawings and product submittals and shall be specifically identified with the applicable Victaulic series or number.
- G. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work (experienced shall mean having a minimum of five previous projects similar in size and scope to this project), familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect. Refer to Division 1 Section "Definitions and Standards" for definitions for "Installers".
- B. Regulatory Requirements: Comply with the requirements of the following codes.
 - 1. NFPA 13 - Standard for the Installation of Sprinkler Systems.
 - 2. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems.
 - 3. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.
- C. All grooved Fire Protection components (including couplings, fittings, valves and accessories) to be supplied by one manufacturer and shall be UL listed and/or FM Global approved. Grooving tools shall be of the manufacturer as the grooved components.

1.7 EXTRA MATERIALS

- A. Valve Wrenches: Furnish to Owner, two valve wrenches for each type of sprinkler installed.
- B. Sprinklers and Cabinets: Furnish six extra sprinklers of each style included in the project. Furnish each style with its own sprinkler cabinet and special wrenches as specified in this Section.

PART 2 - PRODUCTS

2.1 PIPE AND TUBING MATERIALS

- A. General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.
- B. Steel Pipe: ASTM A 120 or ASTM A 53 or A 795 or A 135, seamless, black steel pipe, plain ends.
 - 1. Schedule 40 for 2" and smaller.
 - 2. Schedule 5 for 2" and smaller, Victaulic Pressfit® system.
 - 3. Schedule 10 for 2½" and larger.
 - 4. Schedule 10 for 2 ½" and larger, roll grooved ends as per ANSI/AWWA C-606.

2.2 FITTINGS

- A. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- C. Grooved Mechanical Fittings: ASTM A 47, malleable-iron fittings with grooves or shoulders designed to accept grooved end couplings. Acceptable manufacturers include Stockham, and Victaulic.
- D. Victaulic Pressfit® Fittings: Fitting housings shall be Pressfit® products formed of precision cold drawn steel pipe, as manufactured by Victaulic, with self contained O-ring seals in the fitting ends. Fittings shall be zinc electroplated ASTM B-633 (external only).
- E. Grooved Mechanical Couplings: Consist of ductile iron housing ASTM A-536, Grade 65-45-12, a synthetic rubber gasket of a central cavity pressure-responsive design, grade to suit the intended service conforming to ASTM D-2000, with nuts and bolts heat treated carbon steel track head conforming to ASTM A-449 and A-183, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service. Acceptable manufacturers include Stockham, and Victaulic.
 - 1. Rigid Type:
 - a) 1¼" through 4": Housings shall be cast ductile iron with offsetting, angle-pattern bolt pads. Coupling shall be "Installation Ready" rigid joints designed for direct "stab" installation onto grooved pipe without prior disassembly of the coupling. Victaulic Firelock EZ Style 009.

- b) 5" & larger: Housings shall be cast ductile iron with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Standard rigid joints shall be Victaulic Style Firelock 005 or 07 Zero-Flex.

2. Flexible Type:

- a) 1½" and larger: Use in seismic areas where required by NFPA 13. Victaulic Style 75 or 77.
 - b) 2 through 8": Victaulic Style 791 One piece hinged boltless coupling with locking pin and installation tool for assembly and disassembly and EPDM gasket.
- F. Ductile Iron Flanged Adapters: Flat faced for use with grooved end pipe and fittings for joining ANSI Class 125/150 flanged components to a grooved piping system. Victaulic Style 741 or 744.
- G. Cast-Iron Threaded Flanges: ANSI B16.1, Class 125, raised ground face, bolt holes spot faced.
- H. Cast Bronze Flanges: ANSI B16.24, Class 125, raised ground face, bolt holes spot faced.
- I. Gasket Materials: Thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures. Coupling gaskets shall be UL listed for fire protection services as follows:

Fire Protection Service	Temperature Range	Gasket Recommendation
Dry Systems	Ambient	Flushseal® or EZ Style 009 design, Grade EPDM, Type A
Freezer Applications	-30°F to 0°F (-34°C to -18°C)	Flushseal®, Grade L, Silicone
Water/Wet Systems	Ambient	C-Shape or EZ Style 009 design, Grade EPDM, Type A

2.3 BASIC VALVES

- A. Gate Valves - Two Inch (2") and Smaller: Body and bonnet of cast bronze, 175 pound cold water working pressure - nonshock, threaded ends, solid wedge, outside screw and yoke, rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open. Acceptable manufacturers include Fairbanks, Jenkins, Kennedy Valve, (Div. of ITT Grinnell Valve Co., Inc.), and Stockham.

- B. Ball Valve (2") and Smaller: Standard port ball valve with carbon steel PressFit® ends, 175 psi forged brass body, chrome plated brass ball and stem with TFE seats and EPDM O-ring seal. Victaulic Series 522.
- C. Gate Valves - Two and One-half Inch (2½") and Larger: Iron body; bronze mounted, 175 pound cold water working pressure - nonshock. Valves shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open.
- D. OS&Y Gate Valves 2½" through 12": Ductile iron body, 250 psi grooved ends. ASTM A-536; cast iron yoke and hand wheel, ASTM A-126-B; EPDM coated cast iron disc; ASTM B16 brass rising stem; flanged and epoxy coated cast iron bonnet; EPDM o-ring stem seals and body gasket. Victaulic Series 771.
- E. NRS Gate Valves 2½" through 12": Ductile iron body, ASTM A-536, bronze mounted 250 psi grooved ends; EPDM coated cast iron disc; ASTM B16 brass rising stem; flanged and epoxy coated cast iron bonnet; EPDM o-ring stem seals and body gasket. Victaulic Series 772.
- F. Butterfly Valve 2½" and larger in lieu of Gate Valve: 300 psi grooved ends. Ductile iron body, ASTM A536; ductile iron disc, ASTM A536 with EPDM coating; stainless steel stem and handwheel operated with weather proof actuator. Victaulic Series 705W.
- G. Swing Check Valves: MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Acceptable manufacturers include Fairbanks, Jenkins, Kennedy Valve, (Div. of ITT Grinnell Valve Co., Inc.) and Stockham
- H. Spring Assisted Check Valve 2½" through 12": PPS coated Ductile iron body, ASTM A-536, Grade 65-45-12, aluminium bronze non-slam tilting disc, stainless steel spring and shaft, rubber seat suitable for intended service, stainless steel spring and shaft, 250 psi. Victaulic Series 717.
- I. Spring Assisted Riser Check Valve 4" through 8": Black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, aluminium bronze non-slam tilting disc, stainless steel spring and shaft, rubber seat suitable for intended service, stainless steel spring and shaft, welded-in nickel seat, 200 psi, designed to accept a riser check kit. Victaulic Series 717R.
- J. Alarm Check Valve 1½" through 8": Black enamel coated ductile iron body conforming to ASTM A-536, grade 65-45-12, aluminum bronze clapper, stainless steel spring and shaft, EPDM seal, and Nitrile seat O-ring. Valve internal parts shall be replaceable without removing the valve from the installed position. Water working pressure is 300 psi up to 6" and 225 psi for 8" sizes. Suitable for constant

and variable pressure systems with optional Series 752 retard chamber. Victaulic FireLock® Series 751.

2.4 AUTOMATIC SPRINKLERS

- A. Sprinklers: Fusible link type, and style as indicated or required by the application. Unless otherwise indicated, provide sprinklers with nominal one-half inch ($\frac{1}{2}$ ") discharge orifice, for "Ordinary" temperature range. Provide quick response sprinklers in all light hazard occupancies. Die-cast brass frame, Teflon encapsulated Belleville spring seal and frangible glass bulb. Body cast with hex shaped wrench boss. (Sprinklers shall not contain O-rings.) Quick or standard response type. Acceptable manufacturers include Automatic Sprinkler Corp. of America, Firematic Sprinkler Devices, Inc., Globe Fire Equipment Co., Guardian Automatic Sprinkler Co., Inc., ITT Grinnell, Viking Corp and Victaulic Company.
- B. Sprinkler Finishes: Provide sprinklers with the following finishes.
 - 1. Upright, Pendent, and Sidewall Styles: Chrome plated in finish spaces, exposed to view; rough bronze finish for sprinklers in unfinished spaces and not exposed to view. Sprinklers shall be wax-coated where installed exposed to acids, chemicals, or other corrosive fumes. Victaulic Model V27.
 - 2. Concealed Style: Rough brass, with painted white cover plate. Victaulic Model V38.
 - 3. Flush Style: Bright chrome, with painted white escutcheon plate, Victaulic Model V29.
 - 4. Recessed Style: Bright chrome, with bright chrome escutcheon plate, Victaulic Model V27.
 - 5. Intermediate Level Style: Bright chrome.
- C. Sprinkler Cabinet and Wrench: Finished steel cabinet, suitable for wall mounting, with hinged cover and space for six (6) or twelve (12) spare sprinkler sprinklers plus two (2) sprinkler wrenches. Provide a separate cabinet for each style sprinkler on the project.
- D. Sprinkler Guard and Escutcheons: Guards and Escutcheons shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- E. Flexible Drops:
 - 1. In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic EasyFlex Flexible Drop System may be used to locate sprinklers as required by final finished ceiling tiles and walls.
 - 2. The drop system shall consist of a braided or corrugated type 304/316 stainless steel hose piece, 1" NPT Male threaded adapter for connection to header piping and a $\frac{1}{2}$ " or $\frac{3}{4}$ " NPT Female adapter for connection to the sprinkler head.

3. Unions shall be provided on both ends of the flexible hose for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece bracket that can be installed without the use of tools and have a 3" minimum bending radius for installation in narrow or confined spaces.
4. The braided drop system is UL Listed and FM Approved and the corrugated system is UL Listed for sprinkler services to 175 psi.

2.5 FIRE DEPARTMENT CONNECTIONS

- A. Sidewalk Siamese Connection: Chrome plated cast brass, angle body, two-way, siamese connection. Connection sizes shall be 4" outlet and two (2) and 2½" female inlets, having NH standard threads, for the connection size indicated, as specified in NFPA 1963. Each inlet shall have a clapper valve, and plug and chain. Provide an 18" high chrome plated brass sleeve and chrome plated brass sidewalk plate, with words "STANDPIPE - FIRE DEPT CONNECTION" or "AUTO SPKR - FIRE DEPT CONNECTION," or "AUTO SPKR & STANDPIPE - FIRE DEPT CONNECTION" in raised letters. Acceptable manufacturer of Fire Department Connection is Valve Guardian Fire Equipment, Inc.
- B. Where applicable, install a Victaulic #10-DR 90 degree elbow with drain connection at each Fire Department connection for complete system drainage.

2.6 ALARM DEVICES

- A. General: Types and sizes shall mate and match piping and equipment connections.
- B. Water Flow Indicators: Vane type water flow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2 SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7-ampere 125-volts AC and 0.25-ampere 24-volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover which sends a signal when cover is removed. Acceptable manufacturer: Viking Corp.
- C. Water-Motor Gongs: 10" diameter cast aluminum gong, with factory-finish in red enamel; Pelton Wheel type operator with nylon shaft bearings with internal components of non-corrosive stainless-steel or aluminum, with upstream strainer, and shaft length and sleeve to suit wall thickness and construction; ¾" inlet and 1" drain. Acceptable manufacturer: Victaulic Series 760.
- D. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position. Acceptable manufacturer: Viking Corp.

PART 3 - EXECUTION

3.1 PIPE APPLICATIONS

- A. Install Schedule 40 steel pipe with threaded joints and fittings for 2" or smaller.
- B. Install Schedule 10 steel pipe with roll-grooved ends and grooved mechanical couplings for sizes 2½" and larger.

3.2 PIPING INSTALLATIONS

- A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.
 - 1. Deviations from approved "Working Plans" for sprinkler piping, require written approval of the authority having jurisdiction. Written approval shall be on file with the Architect prior to deviating for the approved "Working Plans".
- B. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.
- C. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions in pipes 2" and smaller, adjacent to each control valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.
- E. Install flanges on valves, apparatus, and equipment having 2½" and larger connections.
- F. Hangers and Supports: Comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems.
- G. Make connections between underground and above-ground piping using an approved transition piece strapped or fastened to prevent separation.
- H. Install mechanical sleeve seal at pipe penetrations in basement and foundation walls.
- I. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.
- J. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than ¼" and having a soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and where they will not be subject to freezing.

3.3 PIPE JOINTS

- A. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Align threads at point of assembly. Apply appropriate tape or thread compound to the external pipe threads. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded. Do not use pipe with threads which are stripped, chipped, corroded, or

otherwise damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

- B. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.
- C. Mechanical Grooved Joints: Cut or roll grooves on pipe ends dimensionally compatible with the couplings. Assemble grooved joints according to manufacturer's (Victaulic) written instructions. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by Victaulic. A Victaulic factory trained representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- D. Steel-Piping, PressFit® Joints: Pipe shall be certified for use with the PressFit system. Pipe shall be square cut, $\pm 0.030"$, properly deburred and cleaned. Pipe ends shall be marked at the required location, using a manufacturer-supplied gauge, to ensure full insertion into the coupling or fitting during assembly. Use a Victaulic "PFT" series tool with the proper sized jaw for pressing.
- E. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.4 VALVE INSTALLATIONS

- A. Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and 14, and the authority having jurisdiction.
- B. Gate Valves: Install supervised-open gate valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division 15 Section "Mechanical Identification" for valve tags and signs.
- C. Install check valves in each water supply connection.

3.5 SPRINKLER INSTALLATIONS

- A. Use proper tools to prevent damage during installations.
- B. Where sprinklers are installed in lay-in tile ceilings, install in the center of tile.
- C. Do not install sprinklers that have been dropped, damaged or show a visible loss of fluid. Never install sprinklers with cracked bulbs. Sprinkler bulb protector shall be removed by hand after installation. Do not use tools or any other device(s) to remove the protector that could damage the bulb in any way.

3.6 FIRE HOSE AND RACK INSTALLATIONS

- A. Install hose and racks in fire hose cabinets specified in Division 10 Section "Fire Extinguishers, Cabinets, and Accessories".

3.7 FIRE DEPARTMENT CONNECTION INSTALLATIONS

- A. Install automatic drip valves at the check valve on the fire department connection to the mains.
- B. Install mechanical sleeve seal at pipe penetration in outside walls.

3.8 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.
- B. Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

END OF SECTION

SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

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 SUMMARY

- A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 22. It expands and supplements the requirements specified in sections of Division 1.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

1.4 PLUMBING INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- B. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- C. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.
- D. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Separate divisional drawings and specifications shall not relieve the Contractor from full responsibility to complete all work which may be indicated on any of the drawings or in any division of the specification.
- B. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work.
- C. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for a complete installation are excluded.
- D. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.
- E. Examine the architectural, structural, electrical and mechanical drawings and specifications prior to submitting bid. Architectural and structural drawings take precedence over mechanical drawings with reference to building construction, location of plumbing fixtures, and any other similar fixed items.
- F. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences which occur between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

1.6 CUTTING AND PATCHING

- A. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Do not cut structural members without prior written approval of the structural Engineer or Architect.
- B. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- C. Perform cutting, fitting, and patching of mechanical equipment and materials required to: uncover Work to provide for installation of ill-timed Work; remove and replace defective Work; remove samples of installed Work as specified for testing; install equipment and materials in existing structures; upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- D. Cut, remove and legally dispose of selected plumbing equipment, components, and materials as indicated, including, but not limited to removal of piping, plumbing fixtures and trim, and other items made obsolete by the new Work.

- E. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to change over.

1.7 PLUMBING SUBMITTALS

- A. Refer to the Conditions of the Contract (General and Supplementary), Division 1 and Division 22 Section: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal definitions, requirements, and procedures. Submittal of shop drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.

1.8 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders, Division 1 and Division 22 Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.9 PRODUCT LISTING

- A. Prepare listing of major plumbing equipment and materials for the project. Submit this listing as a part of the submittal requirement specified.

1.10 PRODUCTS

- A. When two or more items of same material or equipment are required (plumbing fixtures, pumps, valves, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.

1.11 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct

identifications: adequately packaged and protected to prevent damage during shipment, storage, and handling.

- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

1.13 RECORD DOCUMENTS

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 1.
- B. Mark drawings to indicate revisions to piping, size and location both exterior and interior: including locations of valves and other control devices, boxes, and similar units requiring periodic maintenance or repair: actual equipment locations, dimensioned from column lines: actual inverts and locations of underground piping: concealed equipment, dimensioned to column lines: mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.): Change Orders: concealed control system devices.
- C. Mark specifications to indicate approved substitutions: Change Orders; actual equipment and materials used.
- D. Reproducible record drawings shall be on bond paper, of the same size sheets as the contract documents.

1.14 OPERATION AND MAINTENANCE DATA

- A. In addition to the information required by Division 1 for Maintenance Data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions: regulation, control, stopping, shut-down, and emergency instructions: and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting: disassembly, repair, and reassembly: aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.15 WARRANTIES

- A. Refer to the Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division 22, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond: duration of warranty or bond: and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.16 CLEANING

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.

1.17 MECHANICAL COORDINATION DRAWINGS

- A. Prepare and submit a set of coordination drawings showing major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining insulation, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.
- B. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Mechanical equipment room layouts.
 - 2. Specific equipment installations, including:
 - a. Pumps and compressors.
 - b. Tanks and heat exchangers.
 - c. Water heaters and softeners.
 - 3. Work in pipe spaces, chases, trenches, and tunnels.
 - 4. Ceiling plenums which contain piping, ductwork, or equipment in congested arrangement.
 - 5. Installations in mechanical riser shafts, at typical sections and crucial offsets and junctures.
 - 6. Numbered valve location diagrams.
 - 7. Manifold piping for multiple equipment units.

END OF SECTION

SECTION 22 05 53 - PLUMBING 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.

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. Types of identification devices specified in this Section include painted identification materials, plastic pipe markers, valve tags, valve schedule frames, and plastic equipment markers.
- B. Refer to Division 26 sections for identification requirements of electrical work; not work of this Section.
- C. Painting specifications and color coding for pipes and equipment are also included in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ANSI A13.1 for lettering sizes, enamel paint and plastic tape colors, and pressure sensitive vinyl pipe markers.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.
- B. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8" x 11" bond paper. Tabulate valve number, piping system, system abbreviation location of valve and variations for identification. Mark valves which are intended for emergency shut-off and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering mechanical identification materials which may be incorporated in the work include Allen Systems, Inc., Brady (W.H.) Co. (Signmark Div.), Industrial Safety Supply Co., Inc., and Seton Name Plate Corp.

2.2 IDENTIFICATION MATERIALS

- A. Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 22 sections. Provide single selection for each product category.
- B. Painted Identification Materials: Provide standard fiberboard stencils, with not less than 1¼" high letters for ductwork and not less than ¾" high letters for access door signs and similar operational instructions. Provide standard exterior type stenciling enamel, either brushing grade or pressurized spray-can form and grade, and standard identification enamel of colors indicated.
- C. Plastic Pipe Markers: Provide manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers. Print each pipe marker with arrows to indicate flow direction. For pipes with external diameters less than 6" (including insulation), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by adhesive lap joint in pipe marker overlap. For pipes with external diameters of 6" and larger (including insulation) provide either full-band or strip-type pipe markers, but not narrower than three times letter height, laminated or bonded to pipe (or insulation), or taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than ¾" wide; full circle at both ends of pipe marker, tape lapped 3".
- D. Plastic Tape: Provide manufacturer's standard color-coded pressure sensitive (self-adhesive) vinyl tape, not less than three mils thick. Provide 1" wide tape markers on pipes with outside diameters (including insulation) of less than 6", 2½" wide tape for larger pipes.
- E. Valve Tags: Provide 19 gauge polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and valve numbers ½" high, and with 5/32" hole for fastener. Provide 1½" diameter tags and manufacturer's standard solid brass chain or solid brass S-hooks for attachment of tags to valves. Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to the concealed valve.
- F. Valve Schedule Frames: For each page of valve schedule, provide removable glazed display frame. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.3 LETTERING AND GRAPHICS

- A. Designations used in mechanical identification work should correspond with those shown on plans. If not otherwise indicated, provide designations which allow proper identification and operation/maintenance of mechanical systems and equipment.

2.4 COLOR CODING FOR PIPES AND EQUIPMENT

- A. Color coding is to be in accordance with standard color code as developed by the Consulting Engineer. Colors to be selected by Consulting Engineer from Standard Colors of manufacturer. Color code painting shall be provided for all exposed conduits, through items and pipelines for the transport of gases, liquid and

semiliquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and all operating accessories which are integral to the whole functional pipe and electrical conduit system. See Color Code Schedule attached at the end of this Section.

- B. Pipelines which are not listed on the Color Code Schedule shall be assigned a color by the Consulting Engineer and shall be treated as an integral part of the Contract.
- C. Color Code Schedule:

Description	Color
Cold Water Pipe	Blue or match existing color
Exterior Pipe Supports	Match exterior finish of building and coordinate with Owner for finish color.
Support Steel, Equipment tanks, etc.	Battleship gray
Valves	Green body, red handles
Housekeeping Pads/Inertia Bases	Green
Hot Water Piping	Brown

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install identification after completion of surfacing covering and painting, and prior to installation of acoustical ceilings and similar removable concealment.
- B. Provide duct markers or stenciled signs on each access door in housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information. Where access doors are concealed, plasticized tags may be installed for identification in lieu of specified signs.

3.2 PIPING SYSTEM IDENTIFICATION

- A. Install stenciled pipe markers including color-coded background band or rectangle, and contrasting lettering, for each system indicated to receive identification, and include arrows to show normal direction of flow.
- 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 nonconcealed 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 nonaccessible 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.

3.3 VALVE IDENTIFICATION

- A. 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 where directed by Architect/Engineer.

3.4 EQUIPMENT IDENTIFICATION

- A. Paint the equipment identification abbreviation as shown on the plans for all major pieces of mechanical equipment such as water heaters, pumps, compressors, etc., installed under this contract.

3.5 ADJUSTING AND CLEANING

- A. Adjusting: Relocate any 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.

3.6 PAINTING

- A. No paint containing lead will be allowed.
- B. All paint materials and equipment used on the job shall be stored in a single space designated by the Architect and Owner. The storage area shall be kept neat and clean. Floors shall be adequately protected from paint spillage. All cloths and cotton waste which might constitute a fire hazard shall be placed in metal containers and destroyed at the end of each work day. All damage caused to surfaces within the storage area shall be repaired. A fire extinguisher shall be provided and fully charged at all times for this area.
- C. Provide primers and other undercoat paint produced by same manufacturer as finish coats. Primers shall be compatible with finish paints.

- D. All work shall be guaranteed by this Contractor against defects caused by use of inferior materials or workmanship for a period of 1 year from date of final acceptance of building.
- E. All hangers and pipe support floor stands shall be painted. The system shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical motors. Colors shall be as noted in the Color Code Schedule.
- F. All systems which are an integral part of the equipment, that is originated from the equipment and returning to the same piece of equipment, shall be painted between and up to but not including the fixed flanges or connections on the equipment.
- G. All metal surfaces to be painted shall be thoroughly cleaned of objectionable matter before priming or field coat are applied. Wire brushes shall not be used on galvanized and shop painted surfaces.
 - 1. Unpainted Ferrous Metal: Surfaces shall be cleaned with wire brushes or by other proper and acceptable means. Grease and oil shall be removed with gasoline, benzine, or other similar volatile cleaners. The surface shall be free from moisture or frost.
 - 2. Zinc-Coated (Galvanized) Surfaces: Grease and oil shall be removed with gasoline, benzine, or other similar volatile cleaner. Surfaces shall then be treated with an approved chemical compound such as phosphoric acid wash. The chemical compound shall be completely removed with clean, fresh water, and the surfaces thoroughly dried prior to priming.
 - 3. Zinc-Chromate Shop Painted Ferrous Metal: Grease and oil shall be removed with gasoline, benzine, or other similar volatile cleaner.
- H. Structural and miscellaneous metals are specified to be shipped to the job site with prime coat. Items shall be touched-up as necessary at the job site prior to erection.
 - 1. Ferrous materials delivered to the job site without shop coats shall be thoroughly cleaned and primed in the field. Cleaning shall be in accordance with Steel Structures Painting Council Surface Preparations Specifications #2. After cleaning, all surfaces except galvanized shall be primed with zinc-chromate iron oxide primer, equal to Pittsburgh's formulation 17-6. Galvanized surfaces shall be prepared as previously specified and given a special galvanized primer.
- I. After erection, all weld splatter shall be removed and additional cleaning done, as required, to ensure a proper paint bond. The prime shall be applied to all surfaces as soon as possible after cleaning.
- J. Pipe and equipment insulation such as canvas jacket insulation to be painted shall be cleaned of all loose foreign and objectionable material prior to priming.
- K. Wherever previously primed or painted surfaces have been destroyed or defaced, they shall be restored with materials of like kind. Gouges or scratches in

factory-applied finishes shall be filled with suitable fillers and sanded smooth prior to priming and painting or for special finishes, refinished in accordance with manufacturer's recommendations.

- L. The premises shall at all times be kept free from accumulation of waste material and rubbish by employees or work. At the completion of the painting remove all tools, scaffolding, surplus materials, and all rubbish from and about the buildings and leave work area "broom clean" unless more exactly specified.
- M. Upon completion, remove all paint where it has been spilled, splashed, or splattered on floors, fixtures, equipment, furniture, and all other surfaces, leaving the work ready for inspection.

3.7 EXTRA STOCK

- A. Furnish minimum of five percent extra stock of each plumbing identification material required, including additional numbered valve tags for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.
- B. This Contractor shall furnish the Owner with two full gallon cans of each finished color and complete manufacturer label and formula, and color chip with manufacturer's color name and/or code and location at which paint occurs.

END OF SECTION

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 1 Specification 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. Types of mechanical insulation specified in this Section include the following:
 - 1. Insulation of piping, tanks, fittings and other surfaces.

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 five years.
- B. Installer's Qualifications: Firm with at least five years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite plumbing insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of twenty-five or less, and smoke-developed index of fifty or less, in accordance with NFPA 90A-2015.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".
- E. Insulation materials: Insulation materials must be manufactured at facilities certified and registered with an approved registrar to conform to ISO 9000 quality standard.

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.

1.5 DELIVERY AND STORAGE OF MATERIALS

- A. Deliver all materials to the job site and protect the insulation against dirt, water, chemical, and mechanical damage before, during, and after installation. Do not install damaged or wet insulations; remove it from the job site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include Armstrong World Industries, Inc., Knauf Fiber Glass GmbH., Johns-Manville Products Corp., Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp., and Rubatex Corp.

2.2 PIPING INSULATION MATERIALS

- A. Fiberglass Piping Insulation: Preformed sectional fiberglass insulation and factory-applied vapor barrier, all service jacket with pressure sensitive self-sealing longitudinal laps and butt strips. Suitable for operating temperatures from 0EF to +850EF and similar to Johns-Manville's Micro-lok AP-T. Must be Type I, rigid, molded, non-combustible, and must meet ASTM C547.
- B. Flexible unicellular piping insulation (Armaflex): Preformed split sectional closed-cell pipe insulation. Suitable for operating temperatures of -40EF to +220EF. Thermal conductivity "K" factor of 0.27.
- C. Jackets:
 - 1. Type A: Smooth or embossed aluminum jacket, 0.016" minimum thickness secured with ½-inch aluminum bands, for all exterior installations.
 - 2. Type B: Pre-sized reinforced glass cloth, smoothly adhered to insulation or cement surface with lagging adhesive; lap joints a minimum of three inches and adhere with lagging adhesive.
 - 3. Type C: PVC plastic, Zeston 2000, one-piece molded-type fitting covers and Jekting material, gloss-white.
 - 4. Type D: White or embossed, self-adhesive jacket: VentureClad 5-ply laminate for exterior installations.
- D. Fittings: Provide fitting coverings of a similar material and thickness as adjacent pipe coverings. Cover all elbows, tees, valves, flanges and other fittings of piping system.
- E. Accessories: All staples, bands, wires, adhesives, cements, sealers and protective finishes to be as recommended by insulation manufacturers.

2.3 EQUIPMENT INSULATION MATERIALS

- A. Rigid Fiberglass Insulation: Board with factory applied all service jacket, suitable for operating temperatures of 0EF to +450EF. Similar to Johns-Manville's 800 spin-glass.
- B. Flexible Unicellular Equipment Insulation: Closed-cell insulation suitable for operating temperatures of -40EF to +220EF. Exterior applications, apply VentureClad 1577CW – white, highly UV resistant.

- C. Jacketing Material: Provide presized glass cloth jacketing material, not less than 7.8 ounces per square yard or VentureClad 1577CW-embossed 5-ply self-adhesive vapor barrier/weather proofing membrane.
- D. Provide accessories (staples, bands, wire, etc.) and compounds (adhesives, cements, sealers, etc.) as recommended by insulation manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSULATION INSTALLATION, GENERAL

- A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.
- B. Install insulation materials with smooth and even surfaces. Do not use cut pieces or scraps abutting each other.
- C. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered. Maintain integrity of vapor-barrier, and protect to prevent puncture or other damage.
- D. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- E. Protect outdoor insulation from weather or ultraviolet deterioration by installing outdoor protective finish or jacketing; VentureClad 1577CW – white, UV resistant.

3.3 PLUMBING PIPING SYSTEM INSULATION

- A. Omit insulation on chrome-plated exposed piping, air chambers, unions, strainers, check valves, balance cocks, flow regulators, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and preinsulated equipment.
- B. Insulate potable chilled water piping and roof drains and ten feet of connecting drain line with ½-inch flexible Unicellular; VentureClad 1577CW – white for exterior applications.
- C. Insulate potable hot water piping and potable hot water recirculating piping with one of the following types and thicknesses of insulation for circulating mains and runouts. Jacket material shall be VentureClad 1577CW – white for exterior applications.

1. Fiberglass insulation thickness for temperature range:

Pipe Size	100EF - 160EF	161EF - 200EF
up to 1¼"	1"	1"
1½" to 2"	1"	1½"
2½" and up	1½"	2"

2. Flexible Unicellular: Non-circulating runouts, not to exceed ten feet in length for all temperature ranges above, ¾-inch thick insulation for pipe sizes up to one inch.

- D. Install insulation on pipe systems subsequent to painting, testing, and acceptance of tests.
- E. 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.
- F. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply three inch 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 three inch wide vapor barrier tape or band. VentureClad butt strip tape, finish includes white and embossed (permeance 0.0000) or equal.

3.4 EQUIPMENT INSULATION

- A. Insulate the following hot equipment with fiberglass insulation, 2" thick, except 3" thick for low pressure boilers and steam heat exchangers. Jacketing material shall be VentureClad 1577CW – white.
 1. Boilers.
 2. Hot water storage tanks.
 3. Water heaters.
 4. Heat exchangers.
 5. Hot water pumps.
- B. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship. Apply insulation using staggered joint method for both single and double layer construction. Apply each layer of insulation separately. Impale breeching and stack insulation over weld pins or secure with ½" steel bands on twelve inch centers.
- C. Finish with ½" coat of finishing cement. Fill in with cement of sufficient thickness to remove surface irregularities. Cover insulated surfaces with all-service jacketing. Jacketing material shall be VentureClad 1577CW – white self adhesive jacket. Lap seams at least two inches. Apply over vapor barrier where applicable.

3.5 REPAIR, REPLACEMENT AND PROTECTION

- A. Repair or replace damaged sections of existing mechanical insulation, including units with vapor barrier damage and moisture saturated units both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.
- B. Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 22 11 16 - WATER DISTRIBUTION 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.

1.2 SUMMARY

- A. This Section specifies the water distribution piping system, including potable cold, hot, recirculated hot water piping, fittings, and specialties within the building to a point five feet outside the building.
- B. Products installed but not furnished under this Section include water meters which will be provided by others, to the site, ready for installation.

1.3 DEFINITIONS

- A. Water Distribution Piping: A pipe within the building or on the premises which conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Piping: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for water hammer arresters, valves, hydrants, backflow preventors and pressure-temperature relief valves.

1.5 QUALITY ASSURANCE

- A. Comply with applicable portions of the local plumbing code and authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PIPE AND PIPING PRODUCTS

- A. Pipe within building (except below slab), sizes 2" and smaller shall be CPVC Flowguard Gold SDR11, Pipe sizes 2-1/2" to 16" shall be Corzan CPVC Schedule 80. All piping and fittings shall conform with ASTM, ANSI/NSF and CSA standard. Contractor to provide proper type of piping in plenum return to meet local flame/smoke spread rating
- B. Pipe inside and outside building, below ground, sizes 4" and smaller shall be copper tubing. Conform to ASTM B88, Type K, soft temper copper tube. All joints below ground are to be silver brazed.
- C. Balance Cocks, Soldered Ends 2" and smaller: Class 125, bronze body, bronze

plug, screw driver operated, straight or angle pattern. Acceptable manufacturers include American Air Filter Co., Bell & Gossett ITT (Fluid Handling Div.), Hammond Valve Corp., Milwaukee Valve Co., Inc., Spirax Sarco., and Taco, Inc.

- D. Hose Bibbs: Bronze body, renewable composition disc, tee handle, three-fourths inch ($\frac{3}{4}$ " NPT inlet, $\frac{3}{4}$ " hose outlet, vacuum breaker. Acceptable manufacturers for hose bibbs and faucets include Hammond Valve Corp., Lee Brothers (Div. Phelps Dodge Brass Co.), Mansfield Plumbing Products, Nibco Inc., Prier Brass Mfg. Co., Tanner Mfg. Co., and Watts Regulator Co.
- E. Provide proper size for relief valve, in accordance with ASME Boiler and Pressure Vessel Codes. Combined pressure-temperature relief valves shall be bronze body with test lever and thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi; suit wall thickness. Acceptable manufacturers include Cash (A.W.) Valve Mfg. Corp., Conbraco Industries, Inc., Watts Regulator Co., and Zurn Industries, and Inc. (Wilkins-Regulator Div).
- E. Hydrants: Acceptable manufacturers include Josam Mfg. Co., Smith (Jay R.) Mfg. Co., Tyler Pipe (Sub. Of Tyler Corp.), Woodford Mfg. Co., and Zurn Industries Inc. (Hydromechanics Div.).
- F. Backflow Preventors: Acceptable manufacturers include Febco Sales, Inc. (Subs. of Charles M. Bailey Co., Inc.), Hersey Products, Inc., ITT Lawler (Fluid Handling Div.), and Watts Regulator Co.
- G. Water Hammer Arrestors: Provide Plumbing and Draining Institute types A, B, C, D, E, and F. Josam Mfg. Co., Smith (Jay R.) Mfg. Co., Zurn Mfg. Co., and Precision Plumbing Prod.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all water distribution piping is installed in accordance with pertinent codes and regulations, the original design, and the referenced standards. Examine rough-in requirements for plumbing fixtures and other equipment having water connections to verify actual locations of piping connections prior to installation. Coordinate pipe sleeve locations with other disciplines. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PIPING AND PIPING PRODUCTS

- A. So far as practical, install piping as indicated. Solder copper tubing joints in accordance with the procedures specified in ANSI B9.1.
- B. Extend water distribution piping to connect to water service piping as indicated for service entrance to building. Install shutoff valve at service entrance inside building complete with strainer, pressure gauge, and test tee with valve.
- C. Install sleeve and mechanical sleeve seal at penetrations through foundation wall

for watertight installation. Where sleeves penetrate rated partition walls, floors, etc., the integrity of the smoke/fire barrier must be maintained.

D. Valves:

1. Install sectional valves on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment connections, and elsewhere as indicated.
2. Install shutoff valves on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
3. For sectional shutoff valves 2" and smaller, use gate or ball valves; for sectional shutoff valves 2½" and larger, use gate or butterfly valves.

E. Install balance cocks in each hot water recirculating loop, discharge side of each pump, and elsewhere as indicated.

F. Install hose bibbs on exposed piping where indicated with vacuum breaker.

G. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

H. Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Plumbing Code.

I. Install water hammer arresters in locations recommended by manufacturers.

3.3 FIELD QUALITY CONTROL

A. Do not enclose, cover, or put into operation any new, extended, or replaced water distribution piping system until it has been inspected, tested, and approved by the authority having jurisdiction. Work which has been concealed prior to inspection, testing and approval must be uncovered. Notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Prepare inspection reports, signed by the plumbing official. If the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection.

1. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
2. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.

B. All new water distribution piping systems which have been altered, extended or repaired for leaks and defects must be tested. Perform tests in the presence of the plumbing official. Prepare reports for all tests and required corrective action. If testing is performed in segments, submit a separate report for each test, complete

with a diagram of the portion of the system tested.

1. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for a period of four hours. Leaks and loss in test pressure constitute defects which must be repaired using new materials. Retest system until satisfactory results are obtained.

3.4 ADJUSTING AND CLEANING

- A. Purge all new water distribution piping systems and parts of existing systems, which have been altered, extended, or repaired prior to use. Prepare reports for all purging and disinfecting activities.
- B. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction, or in case a method is not prescribed by that authority, the procedure described in either AWWA C601, or AWWA D105, or as described below:
 1. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
 2. Fill the system to be tested, with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate and allow to stand for 24 hours.
 3. Drain the system of the previous solution, and refill with a water/chlorine solution containing at least 200 parts per million of chlorine; isolate and allow to stand for three hours.
 4. Following the allowed standing time, flush the system with clean potable water until chlorine does not remain in the water coming from the system.
 5. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

END OF SECTION

SECTION 22 13 16 - DRAINAGE AND VENT SYSTEMS

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 SUMMARY

- A. This Section specifies building sanitary and storm drainage and vent piping systems, including drains and drainage specialties.

1.3 DEFINITIONS

- A. Building Drain: That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.
- B. Building Sewer: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.
- C. Drainage System: Includes all the piping within a public or private premises which conveys sewage, rain water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.
- D. Vent System: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

1.4 SUBMITTALS

- A. Product Data: Submit product data for drainage piping specialties, floor drains, and roof drains.
- B. Coordination Drawings: Prepare and submit coordination drawings for Drainage and Vent Piping.
- C. Quality Control Submittals: Submit reports specified in Part 3 of this Section.

1.5 QUALITY ASSURANCE

- A. Comply with applicable portions of local plumbing code and the authorities having jurisdiction.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of all drains and associated materials, such as flashings, with other work such as roofing, concrete slabs and sanitary storm sewers to ensure proper interface with all project components.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include Ancon Inc., Josam Mfg. Co., Smith (Jay R.) Mfg. Co., Tyler Pipe (Subs. of Tyler Corp.), and Zurn Industries Inc. (Hydromechanics Div.).

2.2 DRAINAGE AND VENT PIPE AND FITTINGS

- A. Above Ground, All Pipe Sizes: Hubless cast-iron soil pipe. Conform to CISPI Standard 301, service weight, cast-iron soil pipe and fittings, with neoprene gaskets conforming to CISPI Standard 310 and stainless steel clamp and shield.
- B. Underground Pipe Sizes 15" and Smaller: Polyvinyl Chloride (PVC) plastic pipe (type DWV), Schedule 40 pipe and solvent fittings, conforming with ASTM D-2665.
- C. Above Ground, Not In Plenum Returns, and Underground, All Pipe Sizes: Polyvinyl chloride (PVC) DWV, Schedule 40 pipe and socket fittings, conforming with ASTM D-2665. Pipe cement shall be PVC solvent cement conforming to ASTM D-2564.

2.3 DRAINAGE PIPING SPECIALTIES

- A. Trap Primers: Bronze body valve with automatic vacuum breaker, with ½" connections matching piping system. Comply with ASSE 1018.
- B. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.
- C. Floor Cleanouts: Heavy-duty rated cast-iron body and frame, with cleanout plug and adjustable round nickel bronze top, manufacturer's standard cast unit, exposed rim type, with recess to receive c" thick resilient floor finish.
- D. Cast-iron Top: Manufacturer's standard cast unit, exposed flush type, with standard mill finish.
- E. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.
- F. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide under-deck clamp and sleeve length as required.
- G. 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.
- H. Vandal-proof Vent Caps: Cast-iron body full size of vent pipe, with caulked base connection for cast-iron pipes, threaded base for steel pipes.

- I. Roof Drains: See plans for sizes and specifications. Provide static extensions as required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify all existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations. Verify that all drainage and vent piping and specialties may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FOUNDATION PREPARATION FOR UNDERGROUND BUILDING DRAINS

- A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.
- B. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill at each pipe bell hole.

3.3 INSTALLATION, GENERAL

- A. Copper Tubing: Solder joints in accordance with the procedures specified in ANSI B9.1.
- B. Cast-Iron Soil Pipe: Make lead and oakum caulked joints, compression joints, and hubless joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Chapter IV.
- C. PVC Pipe: The pipe and socket must be cleaned, burrs removed, primed, and solvent applied to both. They must be assembled quickly and twisted one-quarter turn to spread the solvent.
- D. Make changes in direction for drainage and vent piping using appropriate 45-degree wyes, half-wyes, or long sweep bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

- E. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- F. Install building drain pitched down at minimum slope of $\frac{1}{4}$ " per foot for piping 3" and smaller and c" for piping 4" and larger unless shown otherwise.
- G. Extend building drain to connect to sewer piping.
- H. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation.
- I. Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the plumbing code. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.4 INSTALLATION OF PIPING SPECIALTIES

- A. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and:
 - 1. as required by plumbing code;
 - 2. at each change in direction of piping greater than 45 degrees;
 - 3. at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping;
 - 4. at the base of each vertical soil or waste stack.
- B. Cleanout Covers: Install floor and wall cleanout covers for concealed piping, types as indicated.
- C. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
- D. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

3.5 INSTALLATION OF FLOOR DRAINS

- A. Install floor drains in accordance with manufacturer's written instructions at low points of surface areas to be drained, or as indicated. Position drains so that they are accessible and easy to maintain. Trap all drains connected to the sanitary sewer.

- B. Set drain elevation depressed below finished slab elevation as listed below to provide proper slope to drain:

DEPRESSION	RADIUS OF AREA DRAINED
$\frac{1}{2}$ "	5'-0"
$\frac{3}{4}$ "	10'-0"
1"	15'-0"
$1\frac{1}{4}$ "	20'-0"
$1\frac{1}{2}$ "	25'-0"

- C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

3.6 FIELD QUALITY CONTROL

- A. Do not enclose, cover, or put into operation any new, extended, or replaced drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction. Work which has been concealed prior to inspection, testing, and approval must be uncovered. Notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Prepare inspection reports, signed by the plumbing official.
1. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
 2. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
 3. If piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspection.
- B. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. Perform tests in the presence of the plumbing official. Prepare reports for all tests and required corrective action. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
1. Rough Plumbing: Test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.
 2. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and

water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.

- C. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

3.7 ADJUSTING AND CLEANING

- A. Clean drain strainers, domes, traps and interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION

SECTION 22 33 00 - WATER HEATERS

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 water heater work required by this Section is indicated on drawings and schedules, and by requirements of this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of water heaters of types and capacities required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Construct water heaters in accordance with UL 1453, "Electric Booster and Commercial Storage Tank Water Heaters".
- C. Provide water heater components which are UL-listed and labeled.
- D. Install electric water heaters in accordance with requirements of NFPA 70, "National Electrical Code".
- E. Provide water heater with Performance Efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in New Building Design".
- F. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data including rated capacities and efficiencies of selected model clearly indicated; operating weights; furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings: Submit manufacturer's assembly type shop drawings indicating dimensions, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's wiring diagrams for control, power, and interlock wiring. Differentiate between factory-installed and field-installed wiring.
- D. Maintenance Data: Submit maintenance data and parts lists for each type and size of water heater, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual.

1.5 SPECIAL PROJECT WARRANTY

- A. Warranty on Coil, Heat Exchanger, and Burner: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, any/all coils, heat exchangers, and burners which have inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation. Warranty period shall be five years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRIC WATER HEATER

- A. Construction: The tank shall be constructed in accordance with U.L. Standards the appropriate symbol, and hydrostatically tested at 190 PSI minimum. Enamel steel jacket; foam insulation; and be completely lined with glass (porcelain enamel).
- B. Equipment: The heater shall be equipped with but not limited to the following equipment: Solid state controls, upper and lower operating thermostats, temperature limiting device, ASME rated temperature and pressure relief valve, 1" ball type drain valve and be UL/ULC listed.
- C. Acceptable manufacturers include Lochinvar Water Heater Corp., Rheem Water Heater Div. (City Investing Co.), Ruud Water Heater Div. (City Investing Co.), Smith Corp. (A.O.) (Consumer Products Div.), State Industries, Inc., and PVI Industries.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which water heaters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

- A. Install water heaters in accordance with manufacturer's installation instructions. Install units plumbing and level, firmly anchored on concrete pads in locations indicated, and maintain manufacturer's recommended clearances. Orient units so controls and devices needing service and maintenance have adequate access.
- B. Connect hot and cold water piping to units with shutoff valves and unions. Extend relief valve discharge outside the building.
- C. Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do

not proceed with water heater start-up until wiring installation is acceptable to water heater Installer.

3.3 FIELD QUALITY CONTROL

- A. Start-up, test, and adjust water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

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 SUMMARY

- A. This Section specifies general installation requirements for plumbing fixtures and specific requirements for fittings, trim, and accessories. Refer to plumbing drawings and Plumbing Fixture Schedule for fixture requirements.

1.3 QUALITY ASSURANCE

- A. Comply with applicable portions of the latest local plumbing code and the authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: Submit product data and installation instructions for each fixture, faucet, specialties, accessories, and trim specified; clearly indicate rated capacities of selected models of water coolers.
- B. Shop Drawings: Submit rough-in drawings, detail dimensions, rough-in requirements, required clearances, and methods of assembly of components and anchorages. Coordinate requirements with other trades as required for installation. Furnish templates as necessary.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements and wiring diagrams for power supply to units. Clearly differentiate between portions of wiring that are factory installed and field installed portions.
- D. Color Charts: Submit manufacturer's standard color charts for cabinet finishes and fixture colors.
- E. Maintenance Data: Include data in maintenance manual as specified in other sections.
- F. Quality Control Submittals: Submit certification of compliance with specified ANSI, UL, and ASHRAE Standards and with performance verification requirements specified in this Section.

PART 2 - PRODUCTS

2.1 FITTINGS, TRIM, AND ACCESSORIES

- A. Supplies and Stops for Lavatories and Sinks: Polished chrome-plated loose-keyed angle stop having ½" inlet and D" O.D. by 12" long flexible tubing outlet, and wall

flange and escutcheon. Insulate the trap and hot water supply for handicapped lavatories with insulation kit.

- B. Supplies and Stops for Water Closets: Polished chrome-plated, loose-keyed angle stop having ½" inlet and D" O.D. by 12" long flexible tubing outlet with collar, and wall flange and escutcheon.
- C. Traps: Cast brass, 1¼" and 1½" adjustable "P" trap with cleanout and waste to wall. All connections at wall shall be slip joint type.
- D. Tub Waste and Overflow Fittings: Concealed lever operated pop-up bath waste and overflow, chrome plated waste spud with universal type outlet connection suitable for one and 1½" I.P.S., or 1½" solder-joint outlet connection on waste tee.
- E. Escutcheons: Chrome-plated cast brass with set screw.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all plumbing fixtures may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards. Examine rough-in for potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings, and pertinent codes and regulations, the original design, and the referenced standards. Fasten plumbing fixtures securely to supports or building structure. Secure behind or within wall construction to provide rigid installation. Comply with the installation requirements of ANSI A117.1 and Public Law 90-480 with respect to plumbing fixtures for the physically handicapped.
- B. Set shower receptor and mop basins in a leveling bed of cement grout.
- C. Install a stop valve in an accessible location in the water connection to each fixture.
- D. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork.
- E. Seal fixtures to walls and floors using silicone sealant as specified in other sections. Match sealant color to fixture color.
- F. Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt in a quantity of one device for each ten fixtures. Furnish faucet repair kits complete with all necessary washers, springs,

pins, retainers, packings, O-rings, sleeves, and seats in a quantity of one kit for each forty faucets.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged fixtures. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.
- B. Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow and stream.
- C. Replace washers of leaking or dripping faucets and stops.

3.4 PROTECTING AND CLEANING

- A. Clean fixtures, trim, and strainers using manufacturer's recommended cleaning methods and materials. Provide protective covering for installed fixtures, water coolers, and trim.
- B. Do not allow use of fixtures for temporary facilities unless expressly approved in writing by the Owner.

END OF SECTION

SECTION 23 05 00 - BASIC MECHANICAL REQUIREMENTS

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 SUMMARY

- A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in sections of Division 1.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

1.4 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components. Verify all dimensions by field measurements. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- B. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- C. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.
- D. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.5 DRAWINGS AND SPECIFICATIONS

- A. Separate divisional drawings and specifications shall not relieve the Contractor from full responsibility to complete all work which may be indicated on any of the drawings or in any division of the specification.
- B. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work.
- C. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for a complete installation are excluded.
- D. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.
- E. Examine the architectural, structural, electrical and mechanical drawings and specifications prior to submitting bid. Architectural and structural drawings take precedence over mechanical drawings with reference to building construction, location of plumbing fixtures, and any other similar fixed items.
- F. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences which occur between drawings and specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

1.6 CUTTING AND PATCHING

- A. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Do not cut structural members without prior written approval of the structural Engineer or Architect.
- B. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- C. Perform cutting, fitting, and patching of mechanical equipment and materials required to: uncover Work to provide for installation of ill-timed Work; remove and replace defective Work; remove samples of installed Work as specified for testing; install equipment and materials in existing structures; upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- D. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including, but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

- E. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to change over.

1.7 MECHANICAL SUBMITTALS

- A. Refer to the Conditions of the Contract (General and Supplementary), Division 1 and Division 23 Section: SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal definitions, requirements, and procedures. Submittal of shop drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.

1.8 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders, Division 1 and Division 23 Section "PRODUCTS AND SUBSTITUTION" for requirements in selecting products and requesting substitutions.

1.9 PRODUCT LISTING

- A. Prepare listing of major mechanical equipment and materials for the project. Submit this listing as a part of the submittal requirement specified.

1.10 PRODUCTS

- A. When two or more items of same material or equipment are required (plumbing fixtures, pumps, valves, air conditioning units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.

1.11 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct

identifications: adequately packaged and protected to prevent damage during shipment, storage, and handling.

- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

1.13 RECORD DOCUMENTS

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division 1.
- B. Mark drawings to indicate revisions to piping and ductwork, size and location both exterior and interior: including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair: actual equipment locations, dimensioned for column lines: actual inverts and locations of underground piping: concealed equipment, dimensioned to column lines: mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.): Change Orders: concealed control system devices.
- C. Mark specifications to indicate approved substitutions: Change Orders; actual equipment and materials used.
- D. Reproducible record drawings shall be on bond paper, of the same size sheets as the contract documents.

1.14 OPERATION AND MAINTENANCE DATA

- A. In addition to the information required by Division 1 for Maintenance Data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions: regulation, control, stopping, shut-down, and emergency instructions: and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting: disassembly, repair, and reassembly: aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.15 WARRANTIES

- A. Refer to the Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

- B. Compile and assemble the warranties specified in Division 23, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond: duration of warranty or bond: and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.16 CLEANING

- A. Refer to the Division 1 Section: PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.
- B. Refer to Division 23 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

1.17 MECHANICAL COORDINATION DRAWINGS

- A. Prepare and submit a set of coordination drawings showing major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of $\frac{1}{4}"=1'-0"$ or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining insulation, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.
- B. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Mechanical equipment room layouts.
 - 2. Specific equipment installations, including:
 - a. Pumps and compressors.
 - b. Tanks and heat exchangers.
 - c. Air handling units.
 - 3. Work in pipe spaces, chases, trenches, and tunnels.
 - 4. Ceiling plenums which contain piping, ductwork, or equipment in congested arrangement.
 - 5. Installations in mechanical riser shafts, at typical sections and crucial offsets and junctures.
 - 6. Numbered valve location diagrams.

Manifold piping for multiple equipment units.

END OF SECTION

SECTION 23 05 14 - MOTORS AND STARTERS

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 this Section.

1.2 SUMMARY

- A. This Section includes basic requirements for motors and starters. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70, "National Electrical Code, and with NEMA MG-1 (2006), "Motors and Generators".
- B. Provide NRTL listed motors. (The term "listed" shall be as defined in "National Electrical Code," Article 100, and "NRTL" (Nationally Recognized Testing Laboratory) shall be as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MOTORS, GENERAL

- A. Provide open drip-proof motors with sufficient capacity to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity. Temperature rise shall be based on 40°C ambient except as otherwise indicated.
- B. Motors ½ HP and larger shall be polyphase. Motors smaller than ½ HP shall be single-phase. Motor frequency ratings shall be 60 Hz, with voltage ratings as determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
 - 1. 120 V Circuit: 115 V - motor rating.
 - 2. 208 V Circuit: 200 V - motor rating.
 - 3. 240 V Circuit: 230 V - motor rating.
 - 4. 480 V Circuit: 460 V - motor rating.

2.2 POLYPHASE MOTORS

- A. Provide NEMA Design B squirrel-cage induction-type motors with double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading of the application. All polyphase motors shall be of the premium efficiency type, with nominal efficiency equal

to or greater than that stated in NEMA MG 1, Table 12-12 for that type and rating of motor.

- B. Multi-speed motors shall have a separate winding for each speed.
- C. Variable speed motors for use with solid-state drives shall be energy efficient, squirrel-cage induction, Design B units with ratings, characteristics and features coordinated with and approved by drive manufacturer.
- D. Internal thermal overload protection for motors, where indicated, shall automatically open control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
- E. Rugged duty motors shall be totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with non-hydroscopic material. External finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.
- F. Coordinate motors with reduced inrush starting with indicated reduced inrush controller type and with characteristics of driven equipment load. Provide required wiring leads in motor terminal box to suit control method.

2.3 SINGLE-PHASE MOTORS

- A. Single-phase motors shall be of one of the following types as selected to suit the starting torque and other requirements of the specific motor application.
 - 1. Permanent Split Capacitor.
 - 2. Split-Phase Start, Capacitor-Run.
 - 3. Capacitor-Start, Capacitor-Run.
- B. Shaded-pole motors may be used only for motors smaller than 1/20 hp.
- C. Internal thermal overload protection for motors, where indicated, shall automatically open the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.
- D. Bearings for belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

2.4 STARTERS

- A. Combination style motor starters will be provided for all three phase single speed or two speed induction motors as shown in the plan. The starters shall be equal to Square D 8538 fusible combination and provided with type RK-5 fuses in accordance with NEC 430-

152 recommendations by the supplier of the starter. Starter enclosures will be as specified or appropriate for the location installed.

- B. All starters will be provided with fused control transformers, line voltage/120V with fuses in each ungrounded conductor. The neutral side of the secondary shall be grounded.
- C. Each starter will be provided with a cover mounted H-O-A selector switch with a green transformer or led pilot light of equal illumination marked "Motor Run" and a red pilot light marked "Motor Off". Full voltage incandescent lamps are not acceptable.
- D. The starter shall be provided with an electronic overload relay, equal to Square D model 9065 motor logic providing unbalanced voltage/voltage failure and class II ground fault protection with ambient compensation. The relay shall be factory set and sealed at FLA to prevent unauthorized tampering in the field.
- E. Each starter shall be provided with auxiliary contacts, (no) with field convertibility.
- F. Each starter shall be provided with terminal block field connections with matching diagrams, including terminals for auxiliary contacts.
- G. Field terminal blocks shall provide terminals for vibration isolators for cooling towers or smoke alarm contacts. These terminals shall be provided with a removable jumper.
- H. Terminal wiring may be factory installed or by a qualified supplier such as CKM Associates, Inc., Phone (813) 818-9809.
- I. Starters shall be delivered to the installing contractor with packing boxes clearly marked as to application.
- J. Reduced voltage motor starters shall be provided for all motors 50 hp and above, with power circuit and control options as specified above. The reduced voltage controller shall be of the solid state type with bypass conductor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. For field installed motors, install motors and starters in accordance with manufacturer's published instructions and the following:
 - 1. Direct Connected Motors: Mount securely in accurate alignment.
 - 2. Belt Drive Motors: Use adjustable motor mounting bases. Align pulleys and install belts. Use belts identified by the manufacturer and tension belts in accordance with manufacturer recommendations.

3.2 COMMISSIONING

- A. Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with the commissioning of the equipment for which the motor is a part. Report unusual conditions, and correct deficiencies of field-installed units.

Verify starters operate correctly in the hand, off and auto modes.

END OF SECTION

SECTION 23 05 19 - METERS AND GAUGES

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 this section.

1.2 DESCRIPTION OF WORK

- A. Extent of meters and gauges required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of meters and gauges specified in this Section include the following:
 - 1. Glass Thermometers.
 - 2. Direct Mount Dial Thermometers.
 - 3. Dial Type Insertion Thermometers.
 - 4. Thermometer Wells.
 - 5. Pressure Gauges.
 - 6. Pressure Gauge Cocks.
 - 7. Gauge Connector Plugs.
 - 8. Venturi - Type Flow Meters.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of meters and gauges, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gauges.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gauge. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

PART 2 - PRODUCTS

2.1 THERMOMETERS

- A. Glass Thermometers: Provide a die cast Cylolac plastic case finished in baked epoxy enamel, with glass front, spring secured, and nine inches long. The adjustable joint shall also be die cast aluminum, with 180° adjustment in vertical plan, 360° adjustment in horizontal plane, with locking device. Provide a clip mounted mercury filled tube and 1% scale range accuracy. Scale shall be satin faced, nonreflective aluminum, with permanently etched markings. Stem shall be

copper-plated steel or brass, for separable socket. Ranges shall be as follows:

1. Hot Water: 30°F - 240°F with 2°F scale divisions.
 2. Chilled Water: 0°F - 120°F with 1°F scale divisions.
 3. Condenser Water: 30°F - 180°F with 2°F scale divisions.
- B. Direct Mount Thermometers: Provide vapor tension, universal angle type with drawn steel or brass, glass lens, 4½" diameter. The adjustable joint shall be die cast aluminum, with 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device. The thermal bulb shall be copper with phosphor bronze bourdon pressure tube, one scale division accuracy. The scale shall be progressive, satin face, nonreflective aluminum with permanently etched marking. Movement shall be brass precision geared. Stem shall be copper plated steel, or brass, for separable socket, length to suit installation. Ranges shall be as follows:
1. Hot Water: 40°F - 240°F.
 2. Chilled Water: 0°F - 120°F.
 3. Condenser Water: 30°F - 180°F.
- C. Dial Type Insertion Thermometers: Provide bi-metal, stainless steel case and stem, 1-inch diameter dial, dust and leak proof, c-inch diameter stem with normal length of five inches, accuracy equal to 0.5% or dial range. Ranges shall be as follows:
1. Hot Water: 0°F - 220°F.
 2. Chilled Water: 25°F - 125°F.
 3. Condenser Water: 25°F - 125°F.
- D. Acceptable manufacturers include Terice (H.O.) Co., Weiss Instruments, Inc., and Weksler Instruments Corp.

2.2 THERMOMETER WELLS

- A. 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.

2.3 TEMPERATURE OR PRESSURE GAUGE CONNECTOR PLUGS

- A. General: Provide temperature gauge connector plugs rated for 500 psi and 200°F (93°C). Construct of brass and finish in nickel-plate, equip with ½" 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. An acceptable manufacturer is Peterson Equipment Co.

2.4 PRESSURE GAUGES

- A. Provide pressure gauges for general use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection. Cases shall be drawn steel or brass, with glass lens, 4½" diameter. Provide a brass connector with ¼" male NPT. Provide a protective siphon when used for steam service. Scales shall be white coated aluminum with permanently etched markings. Accuracy shall be 1%. Ranges shall be as follows:

1. Case: Drawn steel or brass, glass lens, four and 4½" diameter.
2. Connector: Brass with ¼" male NPT. Provide protective siphon when used for steam service.
3. Scale: White coated aluminum, with permanently etched markings.
4. Range: Conform to the following:
 - a. Vacuum: 30" Hg - 15 psi.
 - b. Hot or Chilled Water: 0 - 100 psi.
 - c. Condenser Water: 0 - 60psi.

- B. Acceptable manufacturers include Trerice (H.O.) Co., Weiss Instruments, Inc., Weksler Instruments Corp.

2.5 PRESSURE GAUGE COCKS

- A. Provide pressure gauge cocks between pressure gauges and gauge tees on piping systems. Construct gauge cock of brass with ¼" female NPT on each end, and "T" handle brass plug.

2.6 VENTURI-TYPE FLOW METERS

- A. Provide cast-iron venturi-type flow meters equipped with extended quick connect valves. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Acceptable manufacturers are Rinco Engineering Co. (Berkeley, California), Presco Industries, Aeroquip - Gustin Bacon Division, and P.S.E. Equipment Co.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which meters and gauges are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Installer.

3.2 INSTALLATION

- A. Install temperature gauges, pressure gauges, and flow meters in accessible location and positioned so as to be easily read by an observer standing on the floor.
- B. Install gauge connector plugs in piping tees where indicated, located on pipe at most readable position. Secure cap.

- 3.3 Install pressure gauge cocks in piping tees with snubber. Install siphon for steam pressure gauges.

3.4 ADJUSTING AND CLEANING

- A. Adjust faces of meters and gauges to proper angle for best visibility.
- B. Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 23 05 23 - VALVES

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 SUMMARY

- A. This Section includes general duty valves common to most mechanical piping systems.

1.3 SUBMITTALS

- A. Product Data: Including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

1.4 QUALITY ASSURANCE

- A. MSS Standard Practices: Comply with the following standards for valves:
 - 1. MSS SP-45: Bypass and Drain Connection Standard.
 - 2. MSS SP-67: Butterfly Valves.
 - 3. MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends.
 - 4. MSS SP-71: Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - 5. MSS SP-72: Ball Valves with Flanged or Butt-Welding Ends For General Service.
 - 6. MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends.
 - 7. MSS SP-80: Bronze Gate, Globe Angle and Check Valves.
 - 8. MSS SP-84: Steel Valves - Socket Welding and Threaded Ends.
 - 9. MSS SP-85: Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.
 - 10. MSS SP-92: MSS Valve User Guide.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering valves which may be incorporated in the work include, but are not limited to, those listed.

2.2 VALVE FEATURES

- A. General: Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
- B. Valve Design: Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems

- C. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
- D. Operators: Provide the following special operator features:
 - 1. Handwheels, fastened to valve stem, for valves other than quarter-turn.
 - 2. Lever handle on quarter-turn valves 6" and smaller, except for plug valves. Provide one wrench for every 10 plug valves.
 - 3. Chain-wheel operators for valves 2½" and larger install 72" or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
 - 4. Gear drive operators on quarter-turn valves 8" and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. End Connections: As specified in the individual valves specifications.
 - 1. Threads: Comply with ANSI B2.1.
 - 2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
 - 3. Solder-Joint: Comply with ANSI B16.18. Caution: Where soldered end connections are used, use solder having a melting point below 840°F for gate, globe, and check valves; below 421°F for ball valves.
- H. All valves 2½" and over must be lug-wafer type or flanged and be capable of dead end service at rated pressure without down stream flange.

2.3 GATE VALVES

- A. Gate Valves - 2" and Smaller: MSS SP-80; Class 125, body and bonnet of ASTM B62 cast bronze, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, Graphite/Aramid fiber packing, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

MANUFACTURER	THREADED RS	SOLDER RS
Grinnell	3000	300SJ
Milwaukee	148	149
Nibco	T-111	S-111
Stockham	B-100	B-108

- B. Gate Valves - 2" and Smaller: MSS SP-80; Class 150, body and union bonnet of ASTM B62 cast bronze, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, Graphite/Aramid fiber packing, and malleable iron handwheel. Do not use solder end valves for hot water heating or steam piping applications.

MANUFACTURER	THREADED RS	SOLDER RS
Grinnell	3070	3070SJ
Milwaukee	1151	1169
Nibco	T-135	X
Stockham	B-120	X

- C. Gate Valves - 2½" and Larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and Graphite/Aramid fiber packing and one-piece or two-piece backing gland assembly.

MANUFACTURER	OS&Y RS
Grinnell	6020A
Milwaukee	F-2885
Nibco	617-O
Stockham	G-623

2.4 BALL VALVES

- A. Ball Valves - 1" and Smaller: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction, bronze or brass body conforming to ASTM B584, standard (full or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low pressure stem.

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Grinnell	171N	171S
Milwaukee	BA-100	BA-150
Nibco	T-585	S585
Stockham	T-285-BR-R-70	S-285-BR-R-70
Jomar	T-100NE	S-100ME

- B. Ball Valves - 1½" to 2": Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction, bronze body conforming to ASTM B584, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low pressure steam.

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Jomar	T-600-4B	S-600-4B
Grinnell	171N	171S
Nibco	T-590-Y	S-590-Y
Stockham	T-285-BR-R-70	S-2285-BR-R-70
Milwaukee	BA-300	BA-350

For grooved end connections use Victaulic Style 721

2.5 PLUG VALVES

- A. Plug Valves - 2½" and Larger: MSS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.
1. Nordstrom: 143
 2. Walworth: 1996F

2.6 GLOBE VALVES

- A. Globe Valves - 2" and Smaller: MSS SP-80; Class 125, body and screwed bonnet of ASTM B62 cast bronze, threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, Graphite/Aramid fiber packing, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

MANUFACTURER	THREADED	SOLDER
Grinnell	3200	3200
Milwaukee	502	1502
Nibco	T-211-B	S-211-B
Nibco	T-211-Y	S-211-Y
Stockham	B-16	B-14T or B-17

- B. Globe Valves - 2" and Smaller: MSS SP-80; Class 125, body and screwed bonnet of ASTM B62 cast bronze, threaded ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, Graphite/Aramid fiber packing, and malleable iron handwheel.

MANUFACTURER	THREADED
Grinnell	3240
Milwaukee	590
Nibco	T-235
Stockham	B-22T

- C. Globe Valves - 2½" and Larger: MSS SP-85; Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; outside screw and yoke, bronze mounted, flanged ends, and Graphite/Aramid fiber packing and two-piece backing gland assembly.

MANUFACTURER	STRAIGHT ENDS	ANGLE ENDS
Grinnell	6200A	----
Nibco	F-718-B	F-818-B
Stockham	G-512	G-515
Milwaukee	F-2981	----

2.7 BUTTERFLY VALVES

- A. Butterfly Valves - 2½" and Larger: MSS SP-67: 150 psi, ductile conforming to ASTM A 126, Class.
- B. Valves shall have field replaceable EPDM sleeve, with ductile iron disc (except valves installed in condenser water piping which shall have aluminum bronze or stainless steel disc), stainless steel stem, and EPDM O-ring stem seals. Sizes 2" through 6" shall have lever operators with locks, and sizes 8" through 24" shall have gear operators with position indicator. Valves on dead end service or requiring additional body strength shall be lug-wafer type, drilled and tapped.

MANUFACTURER	LUG LEVER	LUG GEAR
Jomar	600-XX-D-S-E-L	600-XX-D-S-G
Nibco	LD-20103	LD-20105
Stockham	LD-712-DS3-E or LG-522-DS3E	LD-722-DS3-E
Milwaukee	ML122E	----
Grinnell	8000	8000

Grooved Ends: Victaulic Series 700 and 703.

MANUFACTURER	LUG LEVER	LUG GEAR
Jomar	600-XX-D-S-E-L	600-XX-D-S-E-G
Nibco	LD-20003	LD-20005
Stockham	LD-712-BS3-E or LG-712-BS3-E-M	LD-722-BS3-E or LG-722-BS3-E-M
Milwaukee	ML123E	----
Grinnell	8000	8000

Grooved Ends: Victaulic Series 704.

2.8 CHECK VALVES

- A. Swing Check Valves - 2" and Smaller: MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B62, horizontal swing, Y-pattern, with a bronze disc, and having threaded or solder ends. Valve shall be capable of being reground while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available.

MANUFACTURER	CLASS 125		CLASS 150 THREADED
	THREADED	SOLDER MAN	
Jomar	T-511	S-511	T-511
Grinnell	3300	3300SJ	3320
Milwaukee	509	1509	510
Nibco	T-413	S-413	T-433
Stockham	B-319Y	B-309Y	B-321

For grooved Connections use Victaulic Series 712.

- B. Swing Check Valves - 2½" and Larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line.

MANUFACTURER	CLASS 125	CLASS 175
Milwaukee	F2974	X
Nibco	F918	X
Stockham	G-931	X
Grinnell	6300A	----

- C. Lift Check Valves 2" and Smaller: Class 125, cast bronze body and cap conforming to ASTM B62, horizontal or angle pattern, lift type valve, with stainless steel spring, bronze disc holder with renewable "Teflon" disc, and threaded ends. Valve shall be capable of being refitted and ground while the valve remains in the line.

MANUFACTURER	THREADED	SOLDER
Nibco	T-480Y	S-480-Y
Grinnell	3600	3600SJ

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.
- B. Examine threads on both the valve and the mating pipe for form and cleanliness. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.
- C. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

3.2 VALVE SELECTION

- A. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:
1. Copper Tube Size 2" and Smaller: Solder ends, except in heating hot water and low pressure steam service which shall have threaded ends.
 2. Steel Pipe Sizes 2" and Smaller: Threaded or grooved-end.
 3. Steel Pipe Sizes 2½" and Larger: Grooved-end or flanged.

3.3 VALVE INSTALLATIONS

- A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.
- E. Prepare piping for soldered, threaded, and flanged connections and assemble joints in accordance with recognized industry standards.
- F. For dead end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.4 FIELD QUALITY CONTROL

- A. Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

3.5 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

3.6 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

VALVES 2" AND SMALLER

SERVICE	GATE	GLOBE	BALL	CHECK
Chilled Water	125	125	150	125
Domestic Hot and Cold Water	125	125	150	125

VALVES 2½" AND LARGER

SERVICE	GATE	GLOBE	BUTTERFLY	CHECK
Condenser Water	125	125	200	125
Chilled Water	125	125	200	125
Domestic Hot and Cold Water	125	125	200	125
Heating Hot Water	125	125	200	125
Low Pressure Steam	125	125	200	125

END OF SECTION

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.

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. Types of supports and anchors specified in this Section include the following:
 - 1. Horizontal-Piping Hangers and Supports.
 - 2. Vertical-Piping Clamps.
 - 3. Hanger-Rod Attachments.
 - 4. Building Attachments.
 - 5. Saddles and Shields.
 - 6. Miscellaneous Materials.
 - 7. Equipment Supports.

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 five years.
- B. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
- C. UL and FM Compliance: Provide products which are UL-listed and FM approved for sprinkler piping systems.

1.4 SUBMITTALS

- A. The manufacturer shall determine the number, size, and type of anchor bolts, cable restraints, etc. for each piece and groups of pipes.
- B. Details for steel frames to be used in connection with the isolations and seismic restraint of the items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering hangers and supports which may be incorporated in work include Cooper B-Line Systems Inc., Fee & Mason Mfg., Co., Anvil International, and Pipe Shields, Inc

2.2 HANGERS, ATTACHMENTS AND SUPPORTS

- A. Provide factory-fabricated anchors, hangers, attachments, and supports complying with MSS SP-58, 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, attachments, and supports for copper-piping systems.
- B. Horizontal-Piping Hangers and Supports:
 - 1. Adjustable Steel Clevis Hangers: MSS Type 1 (Anvil Fig. 260).
 - 2. Steel Pipe Clamps: MSS Type 4 (Anvil Fig. 212).
 - 3. Adjustable Swivel Pipe Rings: MSS Type 6 (Anvil Fig. 104).
 - 4. Split Pipe Rings: MSS Type 11 (Anvil Fig. 108).
 - 5. U-Bolts: MSS Type 24 (Anvil Fig. 137).
 - 6. Clips: MSS Type 26 (Anvil Fig. 262).
 - 7. Adjustable Pipe Saddle Supports: MSS Type 38 (Anvil Fig. 264), including steel pipe base support and cast-iron floor flange.
 - 8. Single Pipe Rolls: MSS Type 41 (Anvil Fig. 171).
 - 9. Adjustable Roller Hangers: MSS Type 43 (Anvil Fig. 181).
- C. Vertical - Piping Clamps: Two-Bolt Riser Clamps: MSS Type 8 (Anvil Fig. 261).
- D. Hanger - Rod Attachments: Steel Turnbuckles: MSS Type 13 (Anvil Fig. 230).
- E. Building Attachments:
 - 1. Concrete Inserts: MSS Type 18 (Anvil Fig. 285).
 - 2. Top Beam C-Clamps: MSS Type 19 (Anvil Fig. 93).
 - 3. Side Beam or Channel Clamps: MSS Type 20 (Anvil Fig. 225 or 226).
 - 4. Center Beam Clamps: MSS Type 21 (Anvil Fig. 133).
 - 5. C-Clamps: MSS Type 23 (Anvil Fig. 86).
 - 6. Steel Brackets:
 - a. Light Duty: MSS Type 31 (Anvil Fig. 194).
 - b. Medium Duty: MSS Type 32 (Anvil Fig. 195).
 - 7. Horizontal Travelers: MSS Type 58 (Anvil Fig. 170).

2.3 SADDLES AND SHIELDS

- A. 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 Shields: MSS Type 40 (Anvil Fig. 167); of length recommended by manufacturer (minimum 12").

2.4 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.

- B. Steel Plates, Shapes and Bars: Provide products complying with ASTM A 36.
- 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. part cement to 3. parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- E. Equipment Supports: Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings.

PART 3 - EXECUTION

3.1 PREPARATION

- 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.
- B. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed. Correct inadequacies including proper placement of inserts, anchors and other building structural attachments. Installation of hangers, supports, anchors and associated work must be coordinated with all work by other disciplines to avoid conflicts.

3.2 INSTALLATION OF HANGERS, ATTACHMENTS AND SUPPORTS

- A. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers. Install supports with maximum spacings complying with MSS SP-69. Do not use wire or perforated metal to support piping, and do not support piping from other piping. 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.
- B. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment, and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- C. Insulated Piping:
 - 1. Clamps: Attach clamps, including spacers, 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 water piping, install coated protective shields. For pipe eight inches and over, install wood insulation saddles.
- D. Install building attachments within concrete or on structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install

additional supports at concentrated loads 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 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

- E. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with suggested hanger spacing and rod sizes for straight horizontal runs according to MSS SP-69 as tabulated below:

Pipe Size (Inches)	Hanger		Spacing in Feet		Rod Size (Inches)
	Std. Wt.	Steel Pipe	Copper Tube	PVC	
	Water	Steam	Water	Water	
½	5	6	5	4	¼
¾	6	7	5	4	¼
1	7	9	6	4½	¼
1½	9	12	8	4½	d
2	10	13	8	5	d
2½	11	14	9	5	d
3	12	15	10	6	d
4	14	17	12	6½	½
6	17	19	14	7½	½
8	19	21	24	16	e
10	20	26	18	8½	¾
12	23	30	19		f
14	25	32			1
16	27	35			1
18	28	37			1¼
20	30	39			1¼

3.3 ADJUSTING AND CLEANING

- A. Adjust hangers so as to distribute loads equally on attachments.
- B. Provide grout under supports so as to bring piping and equipment to proper level and elevations.
- C. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 23 05 30 - 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.

1.2 SUMMARY

- A. This Section specifies piping materials and installation methods common to more than one section of Division 23 and includes joining materials, piping specialties, including drip pans, sleeves, and seals and basic piping installation instructions.

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 five years.

1.4 SUBMITTALS

- A. Product Data: Submit product data on escutcheons, dielectric unions and fittings, mechanical sleeve seals, and strainers.
- B. Quality Control Submittals: Submit welders' certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-applied plastic end-caps on each length of pipe and tube, except for concrete, corrugated metal, hub-and-spigot, clay pipe. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

PART 2 - PRODUCTS

2.1 JOINING MATERIALS

- A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code.
- B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code.
- C. Soldering Materials: Refer to individual piping system specifications for solder appropriate for each respective system.
- D. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials which conform to their respective ANSI standard (A21.11, B16.20, or B16.21)

2.2 PIPING SPECIALTIES

- A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings. Acceptable manufacturers include Chicago Specialty Manufacturing Co., Sanitary-Dash Manufacturing Company, and Grinnell Co.
- B. Unions: Malleable-iron, Class 150 for low pressure service and Class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
- C. Dielectric Waterway Fittings: Acceptable manufacturers include Epco Sales Inc., and Victaulic Company of America.
- D. Dielectric Unions: Provide dielectric unions which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion. Acceptable manufacturers include Eclipse Inc., Perfection Corp., and Watts Regulator Company.
- E. Y-Type Strainers: Provide strainers full line size of connecting piping. Screens shall be Type 304 stainless steel, with 3/64" perforations at 233 per square inch.
 - 1. Provide strainers with 125 psi working pressure rating for low pressure applications, and 250 psi pressure rating for high pressure application.
 - 2. Threaded or Flanged Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 - 3. Threaded or Flanged Ends, 2½" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 4. Butt Welded Ends, 2½" and Larger For Low Pressure Application: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 5. Butt Welded Ends, 2½" and Larger For High Pressure Application: Schedule 80 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 - 6. Grooved ends, 2½" and Larger: Tee pattern, ductile iron or malleable iron body and access end cap, access coupling with EPDM gasket.
 - 7. Acceptable manufacturers include Armstrong Machine Works, Hoffman Specialty ITT (Fluid handling Div.), Metraflex Corp., R-P & C Valve (Div. White Consolidated Industries Inc.), Spirax Sarco, Victaulic Company of America, and Watts Regulator Co.
- F. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with

snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge.

2. Steel Sleeves: Schedule 40 galvanized welded steel pipe, ASTM A53, Grade A.
- G. 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: 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. Acceptable manufacturers include Thunder Line Corp.
- H. Fire Barrier Penetration Seals:
1. Cracks, Voids, or Holes up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, noncorrosive to metal, compatible with synthetic cable jackets, and capable of expanding ten times when exposed to flame or heat, UL listed.
 2. Openings 4" or Greater: Use sealing system capable of passing three-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°F to 350°F UL listed.
 3. Acceptable manufacturers include Electro Products Div. of 3M, and Nelson (Unit of General Signal).
- I. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2½". Reinforce top, either by structural angles or by rolling top over ¼" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe. Remove scale, slag, dirt, and debris both inside and outside of piping and fittings before assembly.

3.2 INSTALLATIONS

- A. So far as practical, install piping as indicated. Install piping free of sags or bends, tight to slabs, beams, joists, columns, walls, and other permanent elements of the

building. Provide space to permit insulation applications, with one inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing valves.

- B. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, $\frac{3}{4}$ " ball valve, and short $\frac{3}{4}$ " threaded nipple and cap.
- C. Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6" shall be steel; pipe sleeves 6" and larger shall be sheet metal.
- D. Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained.
- E. Fire Barrier Penetration Seals: Provide seals for any opening through fire rated walls, floors, or ceilings used as a passage for mechanical components such as piping or ductwork. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.

3.3 FITTINGS AND SPECIALTIES

- A. Remake leaking joints using new materials.
- B. Install unions adjacent to each valve, and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.
- C. Install flanges in piping 2½" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.
- D. Install dielectric unions to connect piping materials of dissimilar metals in all piping systems.
- E. Pipe Sleeves: Install steel-pipe sleeves except as otherwise 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 two 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 $\frac{1}{4}$ " above level floor finish, and $\frac{3}{4}$ " above concrete and other work around sleeves, and --provide temporary closure to prevent concrete and other materials from entering sleeves.
- F. Drip Pans: Locate drip pans under piping passing over or within three feet 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. Do not run piping above electrical panelboards.

3.4 JOINTS

A. Steel Pipe Joints:

1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads 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.
2. Pipe Larger Than 2":
 - a. Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31. The use of backing rings is acceptable.
 - b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.
 - c. Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.1. Code for Pressure Piping.

B. Nonferrous Pipe Joints:

1. Brazed And Soldered Joints: For copper tube and fitting joints, braze joints in accordance with ANSI B31.1. - Standard Code for Pressure Piping, Power Piping and ANSI B9.1 - Standard Safety Code for Mechanical Refrigeration. Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.
2. Mechanical Joints: Flared compression fittings may be used for refrigerant lines $\frac{3}{4}$ " and smaller.

3.5 TESTING

- A. See individual specification sections in which piping specialties are installed for testing procedures for piping systems.

END OF SECTION

SECTION 23 05 48 - VIBRATION ISOLATION

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 work required by this Section is indicated on drawings and/or specified in other Division 23 sections. Types of vibration isolation specified in this Section include equipment support isolators, equipments bases, resilient lateral guides and flexible pipe connectors.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration isolation, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ASME B31 Series - Code for pressure piping.
- C. All equipment provided under this division shall operate under all conditions of load, free of objectionable sound and vibration. Sound and vibration conditions considered objectionable by the Architect shall be corrected in an approved manner.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including dimensions, loads, static deflections, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All vibration isolation materials and systems shall be supplied by a single, approved manufacturer. Acceptable suppliers are Amber/Booth Co. (A.B.) - Houston, Texas) Korfund Dynamics Corp. (K.D.) - Westburn, New York; Mason Industries, Inc. (M.I.) - Hollis, New York; Peabody Noise Control Inc., (P.N.C.) - Dubin, Ohio; Vibration Mountings & Controls Inc., (V.M.& C.) - Butler, New Jersey.

2.2 EQUIPMENT SUPPORT ISOLATORS

- A. Floor Spring and Neoprene: Spring isolators shall be free-standing and laterally stable without any housing. Spring diameter shall be not less than eighty percent of the compressed height of the spring at the design load. Springs shall have a minimum additional travel to solid equal to fifty percent of the actual deflection. Springs shall have a horizontal to vertical stiffness ratio of approximately one. The spring element shall be set in the neoprene cup and have a steel washer to distribute the load evenly over the neoprene. All mounts shall have leveling bolts

1. If isolators are to be travel limited, all mounts shall have vertical travel limit stops to control extension when weight is removed. The travel limit stops shall be capable of serving as blocking during erection of the equipment. A minimum clearance of ¼-inch shall be maintained around restraining bolts and between the limit stops and the spring to avoid interference with the spring action.
- B. Floor Neoprene: Neoprene isolators shall be neoprene-in-shear type with steel reinforced top and base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be provided in the base and the top shall have a threaded fastener. The mounts shall include leveling bolts that may be rigidly connected to the equipment.
- C. Double Neoprene Pad: Neoprene pad isolators shall be formed by two layers of 5/16 inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. These layers shall be permanently adhered together. Neoprene shall be forty to fifty durometer. The pads shall be sized so that they will be loaded between forty and fifty psi.
- D. Hanger Spring and Neoprene or Glass Fiber: Vibration isolation hangers shall consist of a free standing, laterally stable steel spring and a neoprene or a glass fiber element in series, contained within a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the housing. Spring elements shall have a minimum additional travel to solid equal to fifty percent of the actual deflection at design load. The neoprene element shall be designed to have a 0.3 inch minimum static deflection.
- E. Hanger Neoprene or Glass Fiber: Vibration isolation hangers shall consist of a neoprene-in-shear or a glass fiber element contained in a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30 degree arc before contacting the hanger housing.

2.3 EQUIPMENT BASE TYPES

- A. Inertia Base: Concrete inertia bases shall be formed of stone-aggregate concrete 150 pounds per square foot and appropriate steel reinforcing cast between perimeter structural steel channels. Inertia bases shall include side mounting brackets for attachment to vibration isolators. The steel frame and reinforcement shall be supplied by the vibration isolator manufacturer. Concrete may be provided by the General Contractor.
- B. Roof Curb Type Isolation Bases: Shall be a prefabricated assembly consisting of an extruded aluminum frame and steel spring isolation system that fits over the roof curb and under the isolated equipment. The aluminum frame shall be sufficiently rigid to support the equipment load without detrimental twist or deformation. Spring isolators shall be selected and positioned along the curb to achieve the minimum static deflection called for in the schedule.

The static deflection shall be constant around the entire periphery of the base. Springs shall be free standing, laterally stable with a diameter of not less than 0.8 times the compressed height, and have additional travel to solid that is at least fifty percent of the actual deflection. Resilient neoprene snubbers shall be provided at the corners of the base to limit the movement of the equipment under wind load to 1/4 inch. The isolation curb base shall be made weather tight by sealing all around the periphery with closed cell neoprene or flexible vinyl. This shall in no way inhibit the vibration isolation of the spring elements. A closed cell sponge gasket or field caulking shall be used between the equipment unit and the isolation curb base and between the isolation curb and roof curb to form a weather tight seal. Each spring isolator used in the curbs shall be weather protected.

2.4 RESILIENT LATERAL GUIDES

- A. These units shall be the standard product of the vibration isolation mounting manufacturer incorporating neoprene isolation elements which are specifically designed for providing resilient lateral bracing of vertically rising ducts or pipes.

2.5 FLEXIBLE PIPE CONNECTORS

- A. Pipe size 1½" and smaller shall have flexible metal hose connectors consisting of a corrugated inner metal hose wrapped with a wire protective braid; hose and braid to be stainless steel.
- B. Pipe size 2" and larger shall have rubber expansion joints of the single or double arch type, constructed of molded rubber. Joints shall have flanges integral with the body. Each joint shall be furnished with ANSI 125# drilling and flanges and solid 3/8" thick galvanized steel retaining rings. All units shall be suitable for working pressures up to 150 psig.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Unless otherwise shown or specified, all floor-mounted major equipment items shall be set on four inch high housekeeping type concrete pads. All equipment having moving parts shall be vibration isolated from the building structure. Electrical connections to vibration isolated equipment shall be flexible.
- B. Vibration isolation devices shall be installed for all piping, sheet metal ducts, and plenums as recommended by the manufacturer at the vibration products, and in accordance with recognized industry standards.

3.2 INSTALLATION

- A. Location of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as for proper operation. Installation of vibration isolation equipment shall be in accordance with the manufacturer's written instructions.

- B. Sealed resilient penetration sleeves shall maintain an airtight seal around the penetrating element and shall prevent rigid contact of the penetrating element and the building structure.
- C. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment. Hanger rods for vibration isolated support shall be connected to structural beams or joists, not from the floor slab between beams and joist. Provide intermediate support members as necessary.
- D. Vibration isolation hanger elements shall be positioned so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting the building structure or any object.
- E. No pipes or equipment shall be supported from other pipes or equipment. Resiliently isolated pipes shall not contact any rigid building structure or equipment.
- F. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.
- G. Unless otherwise indicated, there is to be a minimum operating clearance of 1½ " between inertia bases or structural steel frames and the concrete housekeeping pad or floor beneath the equipment.

END OF SECTION

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.

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 23 sections. Types of identification devices specified in this Section include painted identification materials, plastic pipe markers, valve tags, valve schedule frames, and plastic equipment markers.
- B. Refer to Division 26 sections for identification requirements of electrical work; not work of this Section.
- C. Painting specifications and color coding for pipes and equipment are also included in this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Comply with ANSI A13.1 for lettering sizes, enamel paint and plastic tape colors, and pressure sensitive vinyl pipe markers.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.
- B. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8" x 11" bond paper. Tabulate valve number, piping system, system abbreviation location of valve and variations for identification. Mark valves which are intended for emergency shut-off and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for Maintenance Manuals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering mechanical identification materials which may be incorporated in the work include Allen Systems, Inc., Brady (W.H.) Co. (Signmark Div.), Industrial Safety Supply Co., Inc., and Seton Name Plate Corp.

2.2 MECHANICAL IDENTIFICATION MATERIALS

- A. Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 23 sections. Provide single selection for each product category.
- B. Painted Identification Materials: Provide standard fiberboard stencils, with not less than 1¼" high letters for ductwork and not less than ¾" high letters for access door signs and similar operational instructions. Provide standard exterior type stenciling enamel, either brushing grade or pressurized spray-can form and grade, and standard identification enamel of colors indicated.
- C. Plastic Pipe Markers: Provide manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers. Print each pipe marker with arrows to indicate flow direction. For pipes with external diameters less than 6" (including insulation), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by adhesive lap joint in pipe marker overlap. For pipes with external diameters of 6" and larger (including insulation) provide either full-band or strip-type pipe markers, but not narrower than three times letter height, laminated or bonded to pipe (or insulation), or taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than ¾" wide; full circle at both ends of pipe marker, tape lapped 3".
- D. Plastic Tape: Provide manufacturer's standard color-coded pressure sensitive (self-adhesive) vinyl tape, not less than three mils thick. Provide 1" wide tape markers on pipes with outside diameters (including insulation) of less than 6", 2½" wide tape for larger pipes.
- E. Valve Tags: Provide 19 gauge polished brass valve tags with stamp-engraved piping system abbreviation in ¼" high letters and valve numbers ½" high, and with 5/32" hole for fastener. Provide 1½" diameter tags and manufacturer's standard solid brass chain or solid brass S-hooks for attachment of tags to valves. Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to the concealed valve.
- F. Valve Schedule Frames: For each page of valve schedule, provide removable glazed display frame. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.3 LETTERING AND GRAPHICS

- A. Designations used in mechanical identification work should correspond with those shown on plans. If not otherwise indicated, provide designations which allow proper identification and operation/maintenance of mechanical systems and equipment.

2.4 COLOR CODING FOR PIPES AND EQUIPMENT

- A. Color coding is to be in accordance with standard color code as developed by the Consulting Engineer. Colors to be selected by Consulting Engineer from Standard Colors of manufacturer. Color code painting shall be provided for all exposed conduits, through items and pipelines for the transport of gases, liquid and semiliquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and all operating accessories which are integral to the whole functional pipe and electrical conduit system.

See Color Code Schedule attached at the end of this Section.

- B. Pipelines which are not listed on the Color Code Schedule shall be assigned a color by the Consulting Engineer and shall be treated as an integral part of the Contract.
- C. Color Code Schedule:

Description	Color
Chilled Water Pipe	Blue or match existing color
Exterior Pipe Supports	Match exterior finish of building and coordinate with Owner for finish color.
Support Steel, Equipment tanks, etc.	Battleship gray
Valves	Green body, red handles
Housekeeping Pads/Inertia Bases	Green
Heating Hot Water	Orange

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Install identification after completion of surfacing covering and painting, and prior to installation of acoustical ceilings and similar removable concealment.
- B. Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information. Where access doors are concealed, plasticized tags may be installed for identification in lieu of specified signs.

3.2 PIPING SYSTEM IDENTIFICATION

- A. Install stenciled pipe markers including color-coded background band or rectangle, and contrasting lettering, for each system indicated to receive identification, and include arrows to show normal direction of flow.
- 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 nonconcealed 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 nonaccessible 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.

3.3 VALVE IDENTIFICATION

- A. 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. To identify such valves zone "Control Valves" and inspector test valves for fire protection system located above finished ceiling, identification shall be placed on access panel, next to access panel, or on to a nonmovable part of the ceiling system such as a tee-bar grid of a lay-in type ceiling.
- C. Mount valve schedule frames and schedules in machine rooms where indicated or where directed by Architect/Engineer.

3.4 EQUIPMENT IDENTIFICATION

- A. Paint the equipment identification abbreviation as shown on the plans for all major pieces of mechanical equipment such as air handlers, chillers, pumps, exhaust fans, etc., installed under this contract.

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.

3.6 PAINTING

- A. No paint containing lead will be allowed.
- B. All paint materials and equipment used on the job shall be stored in a single space designated by the Architect and Owner. The storage area shall be kept neat and clean. Floors shall be adequately protected from paint spillage. All cloths and cotton waste which might constitute a fire hazard shall be placed in metal containers and destroyed at the end of each work day. All damage caused to surfaces within the storage area shall be repaired. A fire extinguisher shall be provided and fully charged at all times for this area.
- C. Provide primers and other undercoat paint produced by same manufacturer as finish coats. Primers shall be compatible with finish paints.

- D. All work shall be guaranteed by this Contractor against defects caused by use of inferior materials or workmanship for a period of 1 year from date of final acceptance of building.
- E. All hangers and pipe support floor stands shall be painted. The system shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical motors. Colors shall be as noted in the Color Code Schedule.
- F. All systems which are an integral part of the equipment, that is originated from the equipment and returning to the same piece of equipment, shall be painted between and up to but not including the fixed flanges or connections on the equipment.
- G. All metal surfaces to be painted shall be thoroughly cleaned of objectionable matter before priming or field coat are applied. Wire brushes shall not be used on galvanized and shop painted surfaces.
 - 1. Unpainted Ferrous Metal: Surfaces shall be cleaned with wire brushes or by other proper and acceptable means. Grease and oil shall be removed with gasoline, benzene, or other similar volatile cleaners. The surface shall be free from moisture or frost.
 - 2. Zinc-Coated (Galvanized) Surfaces: Grease and oil shall be removed with gasoline, benzene, or other similar volatile cleaner. Surfaces shall then be treated with an approved chemical compound such as phosphoric acid wash. The chemical compound shall be completely removed with clean, fresh water, and the surfaces thoroughly dried prior to priming.
 - 3. Zinc-Chromate Shop Painted Ferrous Metal: Grease and oil shall be removed with gasoline, benzene, or other similar volatile cleaner.
- H. Structural and miscellaneous metals are specified to be shipped to the job site with prime coat. Items shall be touched-up as necessary at the job site prior to erection.
 - 1. Ferrous materials delivered to the job site without shop coats shall be thoroughly cleaned and primed in the field. Cleaning shall be in accordance with Steel Structures Painting Council Surface Preparations Specifications #2. After cleaning, all surfaces except galvanized shall be primed with zinc-chromate iron oxide primer, equal to Pittsburgh's formulation 17-6. Galvanized surfaces shall be prepared as previously specified and given a special galvanized primer.
- I. After erection, all weld splatter shall be removed and additional cleaning done, as required, to ensure a proper paint bond. The prime shall be applied to all surfaces as soon as possible after cleaning.
- J. Pipe and equipment insulation such as canvas jacket insulation to be painted shall be cleaned of all loose foreign and objectionable material prior to priming.
- K. Wherever previously primed or painted surfaces have been destroyed or defaced, they shall be restored with materials of like kind. Gouges or scratches in factory-applied finishes shall be filled with suitable fillers and sanded smooth prior to priming and painting or for special finishes, refinished in accordance with manufacturer's recommendations.

- L. The premises shall at all times be kept free from accumulation of waste material and rubbish by employees or work. At the completion of the painting remove all tools, scaffolding, surplus materials, and all rubbish from and about the buildings and leave work area "broom clean" unless more exactly specified.
- M. Upon completion, remove all paint where it has been spilled, splashed, or splattered on floors, fixtures, equipment, furniture, and all other surfaces, leaving the work ready for inspection.

3.7 EXTRA STOCK

- A. Furnish minimum of five percent extra stock of each mechanical identification material required, including additional numbered valve tags for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.
- B. This Contractor shall furnish the Owner with two full gallon cans of each finished color and complete manufacturer label and formula, and color chip with manufacturer's color name and/or code and location at which paint occurs.

END OF SECTION

SECTION 23 05 94 - TESTING, ADJUSTING, AND BALANCING

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. Related Sections: Other Division 23 sections specify balancing devices and their installation, and materials and installations of mechanical systems.

1.2 SUMMARY

- A. This Section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems.
 - 2. Return air systems.
 - 3. Exhaust air systems.
 - 4. Hydronic systems.
 - 5. Verify temperature control system operation.
- C. Test systems for proper sound and vibration levels.
- D. This Section does not include:
 - 1. Testing boilers and pressure vessels for compliance with safety codes.
 - 2. Specifications for materials for patching mechanical systems.
 - 3. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements¹
 - 4. Requirements and procedures for piping and ductwork systems leakage tests.

1.3 DEFINITIONS

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. The balance of air and water distribution.
 - 2. Adjustment of total system to provide design quantities.
 - 3. Electrical measurement.

- 4. Verification of performance of all equipment and automatic controls.
 - 5. Sound and vibration measurement.
- B. Test: To determine quantitative performance of equipment.
 - C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
 - D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
 - E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
 - F. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
 - G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
 - H. Main: Duct or pipe containing the system's major or entire fluid flow.
 - I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
 - J. Branch main: Duct or pipe serving two or more terminals.
 - K. Branch: Duct or pipe serving a single terminal.

1.4 SUBMITTALS

- A. Engineer and Technicians Data: Submit proof that the Test and Balance Engineer assigned to supervise the procedures and the technicians proposed to perform the procedures meet the qualifications specified below.
- B. Procedures and Agenda:
 - 1. Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
 - 2. Pre-construction Plan Check: Contractor shall review the Plans and/or visit the site prior to the start of construction of the project (new or existing systems). Notify the installing contractor and Architect/Engineer in writing of any modifications or changes to the system(s), and how they should be made to allow the most effective total system balance.
- C. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.

- D. **Certified Reports:** Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.
- E. **Draft Reports:** Within one week of completion of testing, adjusting, and balancing procedures, submit draft report directly to the Engineer on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit two (2) complete sets of draft reports. Only 1 complete set of draft reports will be returned.
1. Immediately notify the Architect/Engineer in writing of any system(s) that do not provide the design quantities as scheduled and specified.
 2. Coordinate with installing contractor, those items or systems that require corrective action to meet design performance, in a timely manner. Retest after corrections have been accomplished.
- F. **Final Report:** Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit four (4) complete sets of final reports.
- G. **Report Format:** Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
1. General Information and Summary.
 2. Air Systems.
 3. Hydronic Systems.
 4. Temperature Control Systems.
 5. Special Systems.
 6. Sound and Vibration Systems.
- H. **Report Contents:** Provide the following minimum information, forms and data:
1. **General Information and Summary:** Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

2. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.
- I. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.5 QUALITY ASSURANCE

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
2. The independent testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified as a Test and Balance Engineer.

B. Codes and Standards:

1. AABC: "National Standards for Total System Balance".
2. ASHRAE: "ASHRAE Handbook," 1999 HVAC Applications Volume, Chapter 36 "Testing, Adjusting & Balancing".

C. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting and balancing.

D. Compliance with the latest approved edition of the "Florida Energy Code for Building Construction".

1.6 PROJECT CONDITIONS

- ### A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.7 SEQUENCING AND SCHEDULING

- A. Test, adjust and balance the air systems before hydronic, steam, and refrigerant systems.
- B. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5°F wet bulb temperature of maximum summer design condition, and within 10°F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

- A. Before operating the system, perform these steps:
 - 1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
 - 2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
 - 3. Compare design to installed equipment and field installations.
 - 4. Walk the system from the central equipment to terminal units to determine variations of installation from design.
 - 5. Check filters for cleanliness.
 - 6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - 7. Prepare report test sheets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check.
 - 8. Determine best locations in main and branch ductwork for most accurate duct traverses.
 - 9. Place outlet dampers in the full open position.
 - 10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 - 11. Lubricate all motors and bearings.
 - 12. Check fan belt tension.
 - 13. Check fan rotation.

3.2 PRELIMINARY PROCEDURES FOR HYDRONIC SYSTEM BALANCING

- A. Before operating the system perform these steps:
 - 1. Open valves to full open position. Close coil bypass valves.
 - 2. Remove and clean all strainers.
 - 3. Examine hydronic systems and determine if water has been treated and cleaned.
 - 4. Check pump rotation.
 - 5. Clean and set automatic fill valves for required system pressure.

6. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
7. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
8. Set temperature controls so all coils are calling for full flow.
9. Check operation of automatic bypass valves
10. Check and set operating temperatures of chillers to design requirements.
11. Lubricate all motors and bearings.

3.3 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all reading with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

3.4 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.

- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications and resubmit test results.

3.5 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

- A. The mechanical contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.
- B. Air Distribution Systems:
 - 1. Verify installation for conformity to design.
 - 2. Ensure that all supply, return, and exhaust ducts are installed in such a manner that maximum allowable leakage rates as required by specifications are not exceeded.
 - 3. Ensure that all volume, splitter, extractor, and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
 - 4. Verify that all supply, return, exhaust, and transfer grilles; registers; diffusers; and high-pressure terminal units are installed and operational.
 - 5. Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air.
 - 6. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
 - 7. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost to the Owner.
 - 8. Install clean filters.
- C. Water Circulating Systems:
 - 1. Verify installation for conformity to design.
 - 2. Check all pumps to verify pump alignment and rotation.

3. Ensure that systems are clean, with the proper strainer screens installed for normal operation.
4. Check all pump motors for current and voltage, to ensure that motors do not exceed nameplate rating.
5. Provide overload protection of proper size and rating.
6. Ensure that all water circulating systems shall be full and free of air; that expansion tanks are set for proper water level; and that all air vents were installed at high point of systems and are operating.
7. Check and set operating temperatures of heat exchangers to design requirements.

3.6 RESPONSIBILITIES OF THE TEMPERATURE CONTROL CONTRACTOR

- A. The temperature-control contractor shall complete the installation of the temperature control system, and operate and test all controls systems to ensure they are functioning properly as designed. The temperature control contractor shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter.
 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
 4. The temperature-control contractor shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

3.7 TESTING FOR SOUND AND VIBRATION

- A. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.8 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

END OF SECTION

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.

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. Types of mechanical insulation specified in this Section include the following:
 - 1. Insulation of piping, tanks, fittings and other surfaces.
 - 2. Insulation of ductwork, air devices and all equipment pertaining to the air distribution system.

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 five years.
- B. Installer's Qualifications: Firm with at least five 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 twenty-five or less, and smoke-developed index of fifty or less, in accordance with NFPA 90A-2015.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".
- E. Insulation materials: Insulation materials must be manufactured at facilities certified and registered with an approved registrar to conform to ISO 9000 quality standard.

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.

1.5 DELIVERY AND STORAGE OF MATERIALS

Deliver all materials to the job site and protect the insulation against dirt, water, chemical, and mechanical damage before, during, and after installation. Do not install damaged or wet insulations; remove it from the job site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers offering products which may be incorporated in the work include Armstrong World Industries, Inc., Knauf Fiber Glass GmbH., Johns-Manville Products Corp., Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp., and Rubatex Corp.

2.2 PIPING INSULATION MATERIALS

- A. Fiberglass Piping Insulation: Preformed sectional fiberglass insulation and factory-applied vapor barrier, all service jacket with pressure sensitive self-sealing longitudinal laps and butt strips. Suitable for operating temperatures from 0EF to +850EF and similar to Johns-Manville's Micro-lok AP-T. Must be Type I, rigid, molded, non-combustible, and must meet ASTM C547.
- B. Cellular Glass Piping Insulation: Preformed split sectional pipe insulation of rigid foamed cellular glass for piping and flat block formed to fit for equipment. Apply with all joints tightly butted and bettered with joint sealer. Secure in place with tape, twelve inches on center, secured with at least two points per section. Cover outdoor insulation with one-eighth inch layer of white fire-retardant vapor-barrier mastic; apply layer of white open weave glass fabric (10" x 20" mesh) with all joints overlapped two inches, and cover with second one-eighth inch layer of same mastic or VentureClad 1577CW-embossed 5-ply self-adhesive vapor barrier/weather proofing membrane with a permeance of 0.0000 when tested per ASTM-E-96; exceeds both UL-723 and ASTM-E84 flame spread and smoke develop. Indoor insulation may be covered with factory-applied white fire-retardant foil-scrim-kraft all purpose jacket or VentureClad 1577CW-embossed 5-ply self-adhesive vapor barrier/weather proofing membrane with a permeance of 0.0000 when tested per ASTM-E-96; exceeds both UL-723 and ASTM-E84 flame spread and smoke develop.
- C. Flexible unicellular piping insulation (Armaflex): Preformed split sectional closed-cell pipe insulation. Suitable for operating temperatures of -40EF to +220EF. Thermal conductivity "K" factor of 0.27.
- D. Jackets:
 - 1. Type A: Smooth or embossed aluminum jacket, 0.016" minimum thickness secured with ½-inch aluminum bands, for all exterior installations.
 - 2. Type B: Pre-sized reinforced glass cloth, smoothly adhered to insulation or cement surface with lagging adhesive; lap joints a minimum of three inches and adhere with lagging adhesive.
 - 3. Type C: PVC plastic, Zeston 2000, one-piece molded-type fitting covers and Jekting material, gloss-white.
- E. Type D: White or embossed, self-adhesive jacket: VentureClad 5-ply laminate for exterior installation Fittings: Provide fitting coverings of a similar material and thickness as adjacent pipe coverings. Cover all elbows, tees, valves, flanges and other fittings of piping system.

- F. Accessories: All staples, bands, wires, adhesives, cements, sealers and protective finishes to be as recommended by insulation manufacturers.

2.3 DUCTWORK INSULATION MATERIALS

- A. Rigid Fiberglass Insulation: Foil-backed, 3 pound per cubic foot density, operating range of 0EF to +450EF and meeting ASTM C612, Type IA and IB, rigid. Similar to Johns-Manville's 814 spin-glass.
- B. Flexible Fiberglass Ductwork Insulation: Foil-backed, $\frac{3}{4}$ pound per cubic foot density blanket, 2.3 inches thick with an installed R-value of 6.5 and meeting ASTM C1136, Type II.
- C. Rigid duct lining: $1\frac{1}{2}$ pound per cubic foot density, one inch minimum thickness, containing an EPA registered anti-microbial coating, having a NRC=0.70 and meeting ASTM C1071.
- D. Lap, Seam and Pin Head Sealing: Presized reinforced glass mesh adhered to insulation or ductwork with fire retardant vapor barrier mastic, or dead soft foil tape.
- E. Provide accessories (staples, bands, wires, etc.) and compounds (cements, adhesives, coatings, etc.) as recommended by insulation manufacturer.

2.4 EQUIPMENT INSULATION MATERIALS

- A. Rigid Fiberglass Insulation: Board with factory applied all service jacket, suitable for operating temperatures of 0EF to +450EF. Similar to Johns-Manville's 800 spin-glass.
- B. Cellular Glass Insulation: Preformed flat block cut for equipment with factory applied all service jacket, or Pittcote 4045 with PC79 fabric or VentureClad 1577CW-embossed 5-ply self-adhesive vapor barrier/weather proofing membrane.
- C. Flexible Unicellular Equipment Insulation: Closed-cell insulation suitable for operating temperatures of -40EF to +220EF. Exterior applications, apply VentureClad 1577CW – white, highly UV resistant.
- D. High Temperature Insulation: Calcium-silicate insulation, suitable for up to 1200°F service, K factor of 0.49 at 600°F, and density of $14\frac{1}{2}$ pounds per cubic foot. Apply VentureClad 1577CW-white, on interior/exterior hot lines.
- E. Jacketing Material: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard or VentureClad 1577CW-embossed 5-ply self-adhesive vapor barrier/weather proofing membrane.

- F. Provide accessories (staples, bands, wire, etc.) and compounds (adhesives, cements, sealers, etc.) as recommended by insulation manufacturer.

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 INSULATION INSTALLATION, GENERAL

- A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.
- B. Install insulation materials with smooth and even surfaces. Do not use cut pieces or scraps abutting each other.
- C. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered. Maintain integrity of vapor-barrier, and protect to prevent puncture or other damage.
- D. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- E. Protect outdoor insulation from weather or ultraviolet deterioration by installing outdoor protective finish or jacketing; VentureClad 1577CW – white, UV resistant.

3.3 HVAC PIPING SYSTEM INSULATION

- A. 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; and on unions.
- B. Insulate refrigerant suction lines between evaporators and compressors, and refrigerant hot gas piping with flexible unicellular insulation: $\frac{3}{4}$ " thick for pipe sizes up to 2"; 1" thick for pipe sizes 2½" and larger. Jacket for exterior application shall be VentureClad 1577-CW – white.
- C. Insulate condensate drain piping inside of the building with flexible unicellular insulation ½" thick for all pipe sizes. Jacket for exterior application shall be VentureClad 1577-CW – white.
- D. Insulate HVAC chilled water supply and return piping with cellular glass insulation, 1½" thick for pipe sizes up to and including 5"; 2½" thick for pipe 6" and larger. Jacketing material shall be VentureClad 1577-CW – embossed high performance self-adhesive vapor barrier/weather proofing membrane.
- E. Insulate HVAC hot water supply and return piping, and steam and condensate piping, with fiberglass insulation of one of the following thickness. Runout piping

shall not exceed ten feet in length to an individual terminal unit.

INSULATION THICKNESS FOR TEMPERATURE RANGE

Pipe Size	120EF- 200EF	201EF- 250EF	251EF- 305EF	306EF- 450EF
Up to 1"	1"	1½"	2"	2½"
1¼" to 2"	1"	1½"	2½"	2½"
2½" to 4"	1½"	2"	2½"	3"
5" to 6"	1½"	2"	3"	3½"
8" and larger	1½"	2"	3"	3½"
Individual runouts: up to 2", not exceeding 12' in length	½"	1"	1½"	1½"

- 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 except where specific form or type is indicated.
- G. Butt pipe insulation against pipe insulation inserts. For hot pipes, apply 3" wide vapor barrier tape (VentureClad butt strip tape) or band the butt joints. For cold piping apply a wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.4 DUCTWORK SYSTEM INSULATION

- A. Do not insulate fibrous glass ductwork, or ductwork where internal insulation or sound absorbing linings have been installed unless otherwise indicated. Do not insulate return ductwork located in return air ceiling plenums.
- B. Insulate outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet; HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet, including neck and plenum of supply diffusers; HVAC return ductwork between room terminal inlet and return fan inlet or HVAC unit inlet; and HVAC plenums and unit housings not preinsulated at factory or lined; with one of the following types and thicknesses of external insulation.
 - 1. Rigid Fiberglass: 1½" thick
 - 2. Flexible Fiberglass: 2" thick, ¾ pounds per cubic foot density, application limited to concealed locations.
- C. Except for oven and hood exhaust duct insulation, install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.5 EQUIPMENT INSULATION

- A. Omit insulation on factory insulated breechings and stacks, double wall breechings, and boilers and other equipment preinsulated at factory.
- B. Insulate refrigeration equipment, including chillers and chilled water pumps, chemical pot feeders, and air separators with cellular glass, 2" thick for surfaces above 35°F, including chilled water pumps and seals. Jacketing material shall be VentureClad 1577CW – embossed.
- C. Insulate the following hot equipment with fiberglass insulation, 2" thick, except 3" thick for low pressure boilers and steam heat exchangers. Jacketing material shall be VentureClad 1577CW – white.
 - 1. Hot water storage tanks.
 - 2. Water heaters.
 - 3. Heat exchangers.
- D. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship. Apply insulation using staggered joint method for both single and double layer construction. Apply each layer of insulation separately. Impale breeching and stack insulation over weld pins or secure with ½" steel bands on twelve inch centers.
- E. Finish with ½" coat of finishing cement. Fill in with cement of sufficient thickness to remove surface irregularities. Cover insulated surfaces with all-service jacketing. Jacketing material shall be VentureClad 1577CW – white self adhesive jacket. Lap seams at least two inches. Apply over vapor barrier where applicable.

3.6 REPAIR, REPLACEMENT AND PROTECTION

- A. Repair or replace damaged sections of existing mechanical insulation, including units with vapor barrier damage and moisture saturated units both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.
- B. Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 23 21 10- PIPES AND 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.

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 23 sections. Types of pipes and pipe fittings specified in this Section include the following:
 - 1. Steel Pipes.
 - 2. Copper Tube.
 - 3. Miscellaneous Piping Materials/Products.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. 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 or certify welding of piping work using Standard Procedure Specifications By, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of 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 manuals.

1.5 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.

PART 2 - PRODUCTS

2.1 STEEL PIPES AND PIPE FITTINGS

- A. Black Steel Pipe: ASTM A 53 or A 106; except comply with ASTM A 53 OR A 106 where close coiling or bending is required. Piping shall be cleaned and have two coats of Rustoleum; after installation, touch up as required at any location that has painting removed as a result of installation.
- B. Galvanized Steel Pipe: ASTM A 53; except comply with ASTM A 53 where close coiling or bending is required.
- C. Seamless Steel Pipe: ASTM A 53 or A 106; except comply with ASTM A 53 or A 106 where close coiling or bending is required.
- D. Galvanized Seamless Steel Pipe: ASTM A 53, or A 120; except comply with ASTM A 53 where close coiling or bending is required.
- E. Electric-Resistance-Welded Steel Pipe: ASTM A 135.
- F. Cast-Iron Flanged Fittings: ANSI B16.1, including bolting.
- G. Cast-Iron Threaded fittings: ANSI B16.4.
- H. Malleable-Iron Threaded Fittings: ANSI B16.3; plain or galvanized as indicated.
- I. Malleable-Iron Threaded Unions: ANSI B16.39; plain or galvanized as indicated.
- J. Threaded Pipe Plugs: ANSI B16.14.
- K. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
- L. Forged-Steel Socket-Welding and Threaded Fittings: ANSI B.16.11, except MSS SP-79 for threaded reducer inserts; rated to match of connected pipe.
- M. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.
- N. Cast-Iron Threaded Drainage Fittings: ANSI B16.12.
- O. Forged Branch-connection Fittings: Comply with installation requirements.
- P. 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 1½", and where pipe size is less than 1½" and do not thread nipples full length (no close-nipples).

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88; 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. Cast-Copper Flared Tube Fittings: ANSI B16.26.
- E. Bronze Pipe Flanges/Fittings: ANSI B16.24.
- F. Copper-Tube Unions: As recommended by manufacturer.

2.3 GROOVED PIPING PRODUCTS

- A. Mechanical grooved pipe couplings and fittings may be used for piping systems having operating conditions not exceeding 250°F excluding steam piping and any other service not recommended by the 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: Ductile iron conforming to ASTM A 536. Housings shall be grooved mechanical type, which engage grooved pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two parts, secured together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.
- C. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties designated by ASTM D 2000.
 - 1. Water Services: EDPM Grade E with green color identification suitable up to 230°F or EPDM Grade EHP with red color identification suitable up to 250°F.
 - 2. Other Services: As recommended by manufacturer (gaskets shall be suitable for the intended service).
- D. Bolts and Nuts: Heat-treated carbon steel, ASTM A 183 and A 449, minimum tensile 110,000 psi. Provide tamper resistant nuts for exposed locations.
- E. 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. Victaulic Style 920/920N.
- F. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.
 - 1. Malleable Iron: ASTM A 47.
 - 1. Ductile Iron: ASTM A 536.
 - 2. Fabricated Steel: ASTM A 53, Type F for ¾" to 1": Type E or S, Grade B for

- 2" to 24".
- 3. Steel: ASTM A 234.

G. Flanges: Conform to Class 125 cast iron and class 150 steel bolt hole alignment.

- 1. Malleable Iron: ASTM A 47.
- 2. Ductile Iron: ASTM A 536.

H. Grooves: Square cut for standard steel, roll grooved for lightweight steel.

K. Acceptable Manufacturers: ITT Grinnell Corp., Stockham Valves & Fittings, Inc., and Victaulic Company of America.

2.4 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Welding Materials: Comply with Section II, Part C ASME Boiler and Pressure Vessel, and with Code for welding materials.
- B. Soldering Materials: Tin-Antimony Solder ASTM B 32, Grade 95TA; or Silver-Lead Solder, ASTM B 32, Grade 96TS.
- C. Brazing Materials: Comply with SFA-5.8 and with code for brazing filler metal materials.
- D. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges; unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Comply with ANSI B31 Code for Pressure Piping.
- B. 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. Where possible, locate insulated piping for 1" clearance outside insulation. Run piping mains 6" or more from fire rated walls to facilitate inspection.
- C. Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces. Do not run piping above electrical panels as specified by NEC.

3.2 PIPING SYSTEM JOINTS

- A. Thread pipe in accordance with ANSI B.21; 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. Do not thread thin wall pipe.
- B. 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.
- C. Weld pipe joints in accordance with recognized industry practice. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
- D. At installer's option, install forged branch-connection fittings wherever branch pipe of size smaller than main pipe is indicated; or install regular "T" fitting.

3.3 CLEANING, FLUSHING, INSPECTING

- A. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings. Inspect each run of each system for completion of joints, supports and accessory items. Inspect pressure piping in accordance with procedures of ASME B31. Disinfect water mains and water service piping in accordance with AWWA C601.

3.4 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. Provide temporary equipment for testing, including pump and gauges. 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 section where test pressure exceeds valve pressure rating. Test each piping system for two hours at 150% of operating pressure indicated, but not less than 25 psi test pressure. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- C. Repair piping systems sections by disassembly and re-installation, using new materials. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION

SECTION 23 21 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 this Section.

1.2 SUMMARY

- A. This Section includes piping systems for hot water heating, chilled water cooling, condenser water, make-up water for these systems, blow-down drain lines, and condensate drain piping. Piping materials and equipment specified in this Section include pipes, fittings, and specialties, special duty valves, and hydronic specialties.

1.3 DEFINITIONS

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

1.4 SYSTEM DESCRIPTION

- A. General: The hydronic piping systems are the "water-side" of an air-and-water or all-water heating and air conditioning system. These systems are classified by ASHRAE as Low Water Temperature, Forced, Recirculating systems.
- B. Four-Pipe System: The four-pipe system includes independent chilled water and hot water supply and return piping mains in a closed loop, connecting the boilers and chillers to the terminal heat transfer units by means of primary/secondary piping loops. Circulation is accomplished by parallel, constant volume, primary pumps and independent secondary pumps.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for each hydronic specialty and special duty valve specified. Include rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions. Furnish flow and pressure drop curves for diverting fittings and calibrated plug valves, based on manufacturer's testing.
- B. Shop Drawings: Submit manufacturer's drawings detailing dimensions, weight loadings, required clearances, methods of assembly of components, and location and size of each field connection.
- C. Coordination Drawings: For hydronic piping.
- D. Maintenance Data: For hydronic specialties and special duty valves, for inclusion in operating and maintenance manuals.

E. Quality Control Submittals:

1. Welders' certificates certifying that welders comply with the quality requirements specified in Quality Assurance below.
2. Certification of compliance with ASTM and ANSI manufacturing requirements for pipe, fittings, and specialties.
3. Submit reports specified in Part 3 of this Section.

1.6 QUALITY ASSURANCE

- A. Qualifications for Welding Processes and Operators: ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification".
- B. ASME Compliance: Fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

1.7 MAINTENANCE

- A. Maintenance Stock: Furnish a sufficient quantity of chemical for initial system start-up and for preventative maintenance for one year from Substantial Completion.

PART 2 - PRODUCTS

2.1 PIPE AND TUBING MATERIALS

- A. Copper Tubing: ASTM B 88, Type L, drawn temper copper tubing with wrought copper fittings and solder joints 2" and smaller, above ground, within building. Use type K, annealed temper copper tubing for 2" and smaller without joints, below ground within slabs. Mechanical fittings (crimp or flair) are not permitted.
- B. Steel Pipe: ASTM A 120 or ASTM A 53, Schedule 40, with threaded joints and fittings for 2" and smaller, and with welded/grooved joints for 2½" and larger. Use mechanical grooved end steel pipe and mechanical couplings and fittings for condenser water piping systems.

2.2 FITTINGS

- A. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.
- B. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.
- C. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.
- D. Grooved Mechanical Fittings: Fittings shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12, forged steel conforming to ASTM A-234, Grade WPB or ASTM A 53 Grade B, steel fittings with grooved ends.
- E. Grooved Mechanical Couplings: Consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts,

bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings, as manufactured by Victaulic Company.

- F. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.
- G. Cast Bronze Flanges: ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.
- H. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of material group 1.1, butt welded end connections, and raised facings.
- I. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony, for heating hot water and low pressure steam piping.
- J. Brazing Filler Metals: AWSA5.8.

WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.

- K. Flexible Connectors: Stainless steel bellows with woven flexible bronze wire reinforcing protective jacket; minimum 150 psig working pressure, maximum 250EF operating temperature. Connectors shall be capable of $\frac{3}{4}$ " misalignment.

2.3 SPECIAL DUTY VALVES

- A. Calibrated Plug Valves: 125 psig water working pressure, 250EF maximum operating temperature, bronze body, plug valve with calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening. Valves 2" and smaller shall have threaded connections and 2½" valves shall have flanged connections. Acceptable manufacturers include Bell & Gossett ITT (Fluid Handling Div.), Taco, Inc., and Thrush Products, Inc.
- B. Pump Discharge Valves: 175 psig working pressure, 300EF maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring-loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett ITT (Fluid Handling Div.), and Taco, Inc.
- C. Pressure Reducing Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Valve shall be factory-set at operating pressure and have the capability for field adjustment. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett ITT (Fluid Handling Div.), Taco, Inc.
- D. Safety Relief Valves: 125 psig working pressure and 250EF maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve

body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Acceptable manufacturers include Amtrol, Inc., Bell & Gossett ITT (Fluid Handling Div.), Spirax Sarco, and Watts Regulator Co.

- E. Automatic Flow Control Valves: Class 150, cast iron housing, stainless steel operating parts; threaded connections for 2" and smaller, flanged connections for 2½" and larger. Factory set to automatically control flow rates within plus or minus five percent design, while compensating for system operating pressure differential. Provide quick disconnect valves for flow measuring equipment. Provide a metal identification tag with chain for each valve, factory marked with the zone identification, valve model number, and rate flow in GPM.

2.4 HYDRONIC SPECIALTIES

- A. Manual Air Vent: bronze body and nonferrous internal parts; 150 psig working pressure, 225EF operating temperature; manually operated with screwdriver or thumbscrew; and having c" discharge connection and ½" inlet connection. Acceptable manufacturers include Armstrong Machine Works, Bell & Gossett ITT (Fluid Handling Div.), Hoffman Specialty ITT (Fluid Handling Div.), Crane Co., Metraflex Co., and Spirax Sarco.
- B. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240EF operating temperature; and having ¼" discharge connection and ½" inlet connection. Acceptable manufacturers include Armstrong Machine Works, Bell & Gossett ITT (Fluid Handling Div.), Hoffman Specialty ITT (Fluid Handling Div.), and Spirax Sarco.
- C. Diaphragm-Type Compression Tanks: Size and number as indicated; construct of welded carbon steel for 125 psig working pressure, 375EF maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., and Taco Inc.
- D. Pump Suction Diffusers: Cast-iron body, with threaded connections for 2" and smaller, flanged connections for 2½" and larger; 175 psig working pressure, 300EF maximum operating temperature. Diffusers shall be complete with inlet vanes with minimum length of 2½ times pump suction diameter; cylinder strainer with 3/16" diameter openings with total free area equal to or greater than five times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head; disposable fine mesh strainer to fit over cylinder strainer; permanent magnet, located in flow stream, removable for cleaning; adjustable foot support, designed to carry weight of suction piping; and blowdown tapping in bottom, gauge tapping in side. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., and Bell & Gossett ITT (Fluid Handling Div.).
- E. Chemical Feeder: Bypass type chemical feeders of five gallon capacity, welded steel construction; 125 psig working pressure; complete with fill funnel and inlet, outlet, and drain valves. Chemicals shall be specially formulated to prevent accumulation of scale and corrosion in piping system and connected equipment,

developed based on a water analysis of make-up water. Acceptable manufacturers include Culligan USA, Vulcan Laboratories (Subsidiary of Clow Corp.), and York-Shipley, Inc.

- F. Y-Pattern Strainers: Cast-iron body (ASTM A 126, Class B), flanged ends for 2½" and larger, threaded connections for 2" and smaller, bolted cover, perforated Type 304 stainless steel basket, bottom drain connection; 125 psig working pressure. Acceptable manufacturers include, Amtrol Inc., Armstrong Pumps, Inc., Bell & Gossett (Fluid Handling Div.), and Taco, Inc.,
- G. Air Separators: Steel tank, with inlet and outlet connections and strainer removal connection. The removable strainer shall be of stainless steel with 3/16" diameter perforations and a free area of not less than five times the cross sectional area of the connecting pipe. Unit shall have separate top fittings for connection to system expansion tank and for air vent. There shall be a bottom connection for blowdown cleaning. Unit must be constructed in accordance with the ASME boiler and pressure vessel code and stamped 125 psig design pressure. Acceptable manufacturers include Amtrol, Inc., Armstrong Pumps, Inc., Bell & Gossett ITT (Fluid Handling Div.), and Taco, Inc.
- H. Basket Strainers: High tensile cast-iron body (ASTM A 126, Class B), flanged end connections, bolted cover, perforated Type 304 stainless steel basket, bottom drain connection; 125 psig working pressure. Acceptable manufacturers include Crane Co., Metraflex Co., and Spirax Sarco.
- I. Flow Venturi: Cast-iron flow venturi equipped with quick connect valves to facilitate connecting of differential pressure meter to flow meter. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Acceptable manufacturers include Rinco Engineering Co. (Berkeley Calif.), Presco Industries, Aeroquip-Gustin Bacon Division, P.S.E. Equipment Co., and Gerand Engineering Co.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. So far as practical, install piping as indicated. Install piping at a uniform grade of 1" in 40' upward in the direction of flow. Make reductions in pipe sizes using eccentric reducer fitting installed with the level side up. Install branch connections to mains using tee fittings in main with take-off out the bottom of the main, except for up-feed risers which shall have take-off out the top of the main line.
- B. Install unions in pipes 2" and smaller, adjacent to each control valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices. Install flanges on valves, apparatus, and equipment having 2½" and larger connections.
- C. Install flexible connectors at inlet and discharge connections to pumps (except inline pumps) and other vibration producing equipment.

- D. Anchor piping to ensure proper direction of expansion and contraction.
- E. Underground preinsulated piping systems shall be buried in a trench not less than 2 feet deeper than the top of the pipe and not less than 18" wider than combined O.D. of all piping systems. A minimum of 24" of compacted backfill over the top of the jacket will meet an H-20 highway loading. Provide thrust blocks at all changes of direction.

3.2 JOINTS

- A. Comply with recommended industry practice for preparation and assembly of soldered, threaded, and flanged joints.
- B. Comply with the procedures contained in the AWS "Brazing Manual" for brazed joints.

3.3 WELDING

- A. Pipe welding shall comply with the provisions of the latest Revision of the Applicable Code, whether ASME Boiler Construction Code, ASA Code for Pressure Piping, or such state or local requirements as may supersede codes mentioned above.

3.4 VALVE APPLICATIONS

- A. General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:
 - 1. Shut-off duty: Use gate, ball, and butterfly valves
 - 2. Throttling duty: Use globe, ball, and butterfly valves
 - 3. Install shut-off duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.
 - 4. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.
- B. Install balancing valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.
- C. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.
- D. Install check valves on each pump discharge and elsewhere as required to control flow direction.
- E. Install pump discharge valves with stem in upward position; allow clearance above stem for check mechanism removal.
- F. Install safety relief valves on all hydronic systems, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.

- F. Install pressure reducing valves on inlet water line, and elsewhere as required to regulate system pressure.

3.5 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system airventing.
- B. Install pump suction diffusers on end suction pump suction inlet; adjust foot support to carry weight of suction piping. Install nipple and ball valve in blowdown connection.
- C. Install pump discharge valves in horizontal or vertical position with stem in upward position. Allow clearance above stem for check mechanism removal.
- D. Install shot-type chemical feeders in each hydronic system where indicated; in upright position with top of funnel not more than forty-eight inches (48") above floor. Install feeder in bypass line, off main using globe valves on each side of feeder and in the main between bypass connections. Pipe drain, with ball valve, to nearest equipment drain.
- E. Install diaphragm-type compression tanks on floor as indicated. Vent and purge air from hydronic system; charge tank.

3.6 FIELD QUALITY CONTROL

- A. Preparation for testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:
 - 1. Leave joints including welds uninsulated and exposed for examination during the test.
 - 2. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
 - 3. Flush system with clean water. Clean strainers.
 - 4. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
 - 5. Install relief valve set at a pressure no more than one-third higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
- B. Testing: Test hydronic piping as follows:
 - 1. Use ambient temperature water as the testing medium, except where there

is a risk of damage due to freezing. Another liquid may be used if it is safe for workers and compatible with the piping system components.

2. Use vents to release trapped air while filling the system.
3. Examine system to see that equipment and parts that cannot withstand test pressures are properly isolated. Examine test equipment to ensure that it is tight and that low pressure filling lines are disconnected.
4. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B 31.9, Code For Pressure Piping, Building Services Piping.
5. After the hydrostatic test pressure has been applied for at least ten minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are no leaks.

3.7 ADJUSTING AND CLEANING

- A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.
- B. Mark calibrated name plates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.
- C. Chemical Treatment: Provide a water analysis prepared by the chemical treatment supplier to determine the type and level of chemicals required for prevention of scale and corrosion. Perform initial treatment after completion of system testing.
- D. Installer shall remove and clean strainer after 24 hours operation and after 30 days operation.

END OF SECTION

SECTION 23 21 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.

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. Types of pumps specified in this Section include in-line booster, in-line circulator, vertical in-line, frame-mounted end suction, close-coupled end suction, and horizontal split case double suction.
- B. Refer to Division 26 sections power supply wiring from power source to power connection on pumps; not 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 five (5) years.
- B. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".
- C. UL and NEMA Compliance: Provide electric motors and components which are listed and labeled by Underwriters' Laboratories and comply with NEMA standards.
- D. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".

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. Maintenance Data: Submit maintenance data and parts lists for each type of pump.

PART 2 - PRODUCTS

2.1 PUMPS, GENERAL

- A. Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of

machinery enamel prior to shipment. Provide pumps of same type by same manufacturer. Motors shall be premium efficiency.

- B. All polyphase motors shall be of the premium efficiency type, with nominal efficiency equal to or greater than that stated in NEMA MG 1, Table 12-12 for that type and rating of motor.

2.2 FRAME-MOUNTED END SUCTION PUMPS

- A. Provide horizontal mount, single stage, vertical split case, frame mounted end suction pumps with flexible coupling, base mounted, designed for 175 psi working pressure. Casing shall be cast iron, 125 psi ANSI flanges, tappings for gauge and drain connections. Pump shaft shall be steel with replaceable shaft sleeve. Pumps shall have regreasable ball bearings, and mechanical seals, with carbon seal ring and ceramic seat. Motors shall be non-overloading at any point on pump curve, open, drip-proof, with ball bearings having 15,000 hours bearing life, and with lifting lug on top of motor. Impeller shall be enclosed bronze type, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw. Provide structural steel base plate with welded cross members, and open grouting area, and flexible coupling, capable of absorbing torsional vibration, equipped with coupling guard.
- B. Acceptable manufacturers include Amtrol Inc., Armstrong Pumps, Inc., Aurora Pump (Unit of General Signal), Bell & Gossett ITT (Fluid Handling Div.), Federal Pump Corp., Peerless Pump (Indian Head Co.), Weinman Pump LFE Corp. (Fluids Control Div.), and Worthington Pump, Inc.

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. Install HVAC pumps in accordance with manufacturer's published installation instructions, complying with recognized industry practices. Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer.
- B. Install base-mounted pumps on minimum of 4" high concrete base equal or greater than three times total weight of pump and motor, with anchor bolts poured in place. Set and level pump, grout under pump base with nonshrink grout.

3.3 ADJUSTING AND CLEANING

- A. 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. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

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Do not start pumps with mechanical seals until system is under pressure and pumps are protected by strainers.

- C. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 23 25 00 - WATER TREATMENT

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 SUMMARY

- A. This Section specifies condenser/tower and chilled water treatment and associated automated controls.
- B. Refer to section "Boiler" for other water systems treatment, if applicable.

1.3 SUBMITTALS

- A. Product data shall include equipment descriptions, chemical descriptions, environmental protection agency acceptance documents, and electrical and piping schematics.

1.4 QUALITY ASSURANCE

- A. Single source responsibility: Comply with requirements of section "Basic Mechanical Requirements" under "Product Options".
- B. Systems and chemicals shall meet all local, state and federal and safety requirements.

PART 2 - PRODUCTS

2.1 CHILLED WATER TREATMENT

A. WATER TREATMENT RESPONSIBILITY

Closed Loop System - Responsibility will be one year from the start up date following owner acceptance. Treatment will be started after the loop is flushed and correctly passivated.

B. FULL SERVICE VISITS FOR CHEMICAL WATER TREATMENT

A qualified service technician will visit the facility at least once quarterly to perform the appropriate testing of water in each system to determine water treatment effectiveness.

1. Service Includes:

- a. Closed Loop Systems -chemical water treatment
- b. Provide for installation one (1) each five (5) gallon one-shot feeder with quick opening screw cap for operating pressure of 175 psi with

bleed off valve. Shot feeder should be equipped with side stream bag to handle (2%) of system flow.

- c. Test sample for pH
- d. Testing for Conductivity
- e. Maintain sodium nitrite at 600-800 ppm cold water and 800-1000 ppm hot water or sodium molybdate at appropriate levels. Treatment shall contain borate for pH buffering.
- f. Visually inspect for clarity.
- g. Make adjustments if necessary.
- h. Provide training to the facility on the water treatment provided

C. LABORATORY ANALYSIS

This program includes laboratory support for on-site testing procedures for verification or troubleshooting as required. The laboratory shall provide state of the art analysis equipment and chemists. The lab shall have a full time trained staff and a full time laboratory capable of doing:

- 1. Routine water analysis
- 2. Corrosion test strip analysis
- 3. X-ray diffraction analysis
- 4. Complete microbiological examinations
- 5. Metallographic analysis
- 6. Atomic absorption analysis

D. PROGRAM MONITORING

- 1. Perform corrosion coupon study test for iron and copper to maintain < 3 mpy mild steel and < 0.2 copper
- 2. Testing for copper and iron will be done by the Water Treatment Company a minimum of twice annually of the closed loop water at the ppm level for iron and ppb level for copper.

E. WRITTEN REPORTS

A written report will be submitted to the owner designated personnel on each visit indicating service provided, recommendations and corrective actions.

F. OWNER OR OPERATOR RESPONSIBILITY .

The owner is expected to promptly repair any malfunctioning equipment and address any treatment concerns that are under this water treatment agreement as identified at time of service and conveyed to the owner.

G. APPROVED BIDDERS - TAMPA BAY TRANE, NALCO, GE BETZ

2.4 WATER TREATMENT PROGRAM CHEMICAL FLUSH

A. WATER TREATMENT CHEMICAL FLUSH

Closed and Open Loop Systems -The Water Treatment Company working with the

installation contractor, will be responsible to provide chemicals and inspection services to ensure a thoroughly flushed and cleaned new system. Maintenance chemical treatment will not be started until after the loops are flushed, inspected and correctly passivated.

B. BASIC CLEANING PROCEDURES - CLOSED OR OPEN SYSTEMS

1. After the Pressure and Leak Tests of the completed open and closed loop systems, supervise the performance of the following:
2. Open all control valves within the system on heat exchangers, cooling coils, heating coils, etc.
3. Open fully all hand valves at the heat exchangers, cooling coils, heating coils, etc.
4. Install construction (fine mesh) screens in all strainers and suction diffusers.
5. Fill the system with water and circulate, drain the system. Clean tower and strainers.
6. Refill the system with water and bleed all air pockets. Circulate water as many hours as needed to insure proper water flow to all areas of the system to remove all air. Flushing of the system shall be performed with all valves open and in the by-pass position.
7. Repeat the above process until water is sufficiently clean. Sufficiently clean will be determined by conductivity, pH and water testing.
8. Insert chemical cleansing agents at recommended levels. The system shall be cleaned with a liquid blend of inorganic phosphate, an organic corrosion inhibitor, a dispersant, and an oil emulsifier. The chemical must clean and passivate. An appropriate antifoam shall also be used if required.
9. Run the pumps as needed to fully disperse the cleaning agent throughout the piping and system. Typical flush time can range from 2-24 hours as needed to insure proper chemical cleaning of the system.
10. Drain, flush, and refill the system.
11. Visually inspect and test the water. If the water is not sufficiently clean and free of chemicals, repeat the draining, flushing and refilling process until it is clean. Sufficiently clean will be determined by conductivity, pH and water testing.
12. Test for system sterility. Add non-oxidizing biocide chemical treatment until system is sterile.
13. Add scale corrosion inhibitor chemical.
14. Install size fifty (50) micron filter in the filter units and open the by-pass to provide the required water flow.
15. Operate all the pumps at least one (1) hour at full flow to insure proper chemical mix.
16. Remove the size fifty (50) micron filters and if necessary install new micron filter of reduced size. A twenty-five (25) down to a five (5) micron filter may be employed.
17. Check water samples for:
 - a. Conductivity
 - b. pH
 - c. Iron and Copper
 - d. Color/Clarity
 - e. Chemical level
18. If debris remains in the system, repeat the above procedure and continue

repeating until clean.

C. WRITTEN REPORT

A written report on our findings will be submitted to the owner or designated personnel upon completion of cleaning. The report shall include the final water quality insuring the piping and equipment is clean and ready for the maintenance chemical treatment.

D. APPROVED BIDDERS TAMPA BAY TRANE, NALCO, GE BETZ

PART 3 - EXECUTION:

3.1 INSTALLATION

A. Install all valves, gauges and indicators in readable accessible locations.

3.2 COORDINATION

A. Coordinate installation and interface with piping installation.

3.3 ADJUSTING AND CLEANING

A. Prior to owner acceptance, make all final adjustments to chemical feed system and clean tanks, pumps, piping, indicators, etc.

END OF SECTION

SECTION 23 31 13 - METAL 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 SUMMARY

- A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gauge.

1.3 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as the joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system.
- B. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Section.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for duct liner, sealing materials, and fire-stopping materials.

C. Submittals for Seismic Restraints:

1. The seismic and vibration control manufacturer shall determine the number, size, and type of anchor bolts, cable restraints, etc. for each section of ductwork.
2. Complete engineering calculations and drawings for all vibration and seismic requirements for all piping, except calculations are not required where restraints conform to SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Systems".
3. Details for steel frames to be used in connection with the isolation and seismic restraint of the items.

E. Record Drawings: Include duct systems routing, fittings details, and installed accessories and devices.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 90A-2002, "Standard for the Installation of Air Conditioning and Ventilating Systems".
- B. Comply with NFPA 96-1998, "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations".
- C. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".
- D. Comply with the latest approved edition of the SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Systems".
- E. Comply with UL 723 and UL 181B for duct sealants for metal ductwork.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 653, Coating Designation G 90. Provide mill-phosphatized finish for duct surfaces exposed to view.
- C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- D. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts, provide reinforcing of compatible materials.
- E. Tie Rods: Galvanized steel, ¼" minimum diameter for 36" length or less; d" minimum diameter for lengths longer than 36".

2.2 DUCT LINER

- A. General: Comply with NFPA Standard 90A-2015 and TIMA Standard AHC-101.
- B. Materials: ASTM C 1071, Type I, with coated surface exposed to airstream to prevent erosion of glass fibers. Thickness shall be 1", with 1½ pound per cubic foot density, and "K-Factor" equal to 0.24 or better, at a mean temperature of 75°F. Liner shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not higher than 50, when tested in accordance with ASTM C 411. Comply with ASTM C 916 for liner adhesive. Minimum noise reduction coefficient (NRC) for 1" liner shall be 0.70.
- C. The air stream surface shall have 100% coverage of an acrylic polymer coating formulated with an immobilized EPA registered preservative proven resistant to microbial growth as determined by ASTM G21 and G22.
- D. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer; that do not cause leakage in the duct; and will indefinitely sustain a 50-pound tensile dead load test perpendicular to the duct wall.
 - 1. Fastener Pin Length: As required for thickness of insulation, and without projecting more than c-inch into the airstream.
 - 2. Adhesive For Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

2.3 FLEXIBLE DUCTS

- A. Either spiral-wound spring steel with flame-proof vinyl sheathing, or corrugated aluminum; complying with UL 181. Provide one inch (1") thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

2.4 SEALING MATERIALS

- A. Joint and Seam Sealants, General: Seal all joints and seams. The term sealant used here is not limited to materials of adhesive nature, but also includes tapes and combinations of open weave fabric strips and mastics.
- B. Joint and Seam Sealant: One-part, nonsag, solvent-release curing, polymerized butyl sealant complying with FS TT-S-001657 and UL 723, Type I; formulated with a minimum of 75 percent solids.
- C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.5 FIRE-STOPPING

- A. Fire-resistant Sealant: Provide one-part, elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations

through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
2. "Pensil 851"; General Electric Co.
3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
5. "RTV 7403"; General Electric Co.
6. "Fyre Putty"; Standard Oil Engineered Materials Co.
7. Fire Temp"; Johns Manville.

2.6 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder-actuated concrete fasteners, unless approved in writing by the structural engineer.
- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod. Straps and rod sizes shall conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet width and gauge and steel rod diameters. Hangers installed in corrosive atmospheres shall be electro-galvanized all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
 2. For stainless steel ducts, provide stainless steel support materials.
 3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.
 4. For copper ducts, provide copper, bronze or brass support materials.

2.7 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards", Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

- B. Fabricate kitchen hood exhaust ducts with 16-gauge, carbon steel sheets for concealed ducts and 18-gauge stainless steel sheets for exposed ducts. Weld and flange seams and joints. Conform to NFPA Standard 96, 2001.
- C. Fabricate dishwasher hood exhaust ducts with aluminum sheets. Solder seams and joints.
- D. Acid-Resistant Ducts: Provide factory-fabricated ducts and fittings only; no shop or field fabrication will be allowed. Refer to "PVC-Coated Galvanized Steel Sheets" in this Section for materials.
- E. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 - 1. Supply Ducts: 3 inches water gauge.
 - 2. Return Ducts: 2 inches water gauge, negative pressure.
 - 3. Exhaust Ducts: 2 inches water gauge, negative pressure.
- F. Cross-breaking or Cross Beading: Cross-break or bead duct sides that are 19 inches and larger and are 20-gauge or less, with more than 10 square feet of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard", Figure 1-4, unless they are lined or are externally insulated.

2.8 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard", 1985 Edition, Figures 2-1 through 2-10.

2.9 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with 100 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is prohibited. Apply a coat of adhesive to liner facing in direction of airflow not receiving metal nosing. Butt transverse joints without gaps and coat joint with adhesive. Fold and compress liner in corners of rectangular ducts or cut and fit to assure butted edge overlapping. Coat all exposed raw edges with superseal coating.
- B. Avoid longitudinal joints in rectangular ducts wherever possible.
- C. Secure liner with mechanical fasteners 4" from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3" from transverse joints and at intervals not exceeding 18 inches longitudinally.
- D. Secure transversely oriented liner edges facing the airstream with metal nosings that are either channel or "Z" profile or are integrally formed from the duct wall at the following locations:
 - 1. Fan discharge.
 - 2. Intervals of lined duct preceding unlined duct.

- E. Terminate liner with duct build-outs installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated build-outs (metal hat sections) or other build-out means are optional; when used, secure build-outs to the duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire damper sleeve through fire separation.

2.10 ROUND AND FLAT OVAL DUCT FABRICATION

- A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.
- B. Round Ducts: Fabricate round supply ducts with spiral lock-seam or longitudinal seam construction. Comply with SMACNA "HVAC Duct Construction Standards", Table 3-2 for galvanized steel gauges.
- C. Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lock-seams (without intermediate ribs) or with butt-welded longitudinal seams in gauges listed in SMACNA "HVAC Duct Construction Standards", Table 3-4.
- D. Double-wall (Insulated) Ducts: Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
 - 1. Thermal Conductivity: 0.27 Btu/square foot/degree F./inch thickness at 75°F mean temperature.
 - 2. Outer Shell: Base outer shell gauge on actual outer shell dimensions. Provide outer shell lengths 2" longer than inner shell and insulation, and in gauges specified for single-wall duct.
 - 3. Insulation: Unless otherwise indicated, provide 1" thick fiberglass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or noninsulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.
 - 4. Solid Inner Liner: Construct round and flat oval inner liners with solid sheet metal of the gauges listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter".
 - a. 3 to 8 inches: 28-gauge with standard spiral construction.
 - b. 9 to 42 inches: 28-gauge with single-rib spiral construction.
 - c. 44 to 60 inches: 26-gauge with single-rib spiral construction.
 - d. 62 to 88 inches: 22-gauge with standard spiral construction.
 - 5. Maintain concentricity of liner to outer shell by mechanical means. Protect insulation from discoloration by mechanical means.

2.11 ROUND AND FLAT OVAL SUPPLY AND EXHAUST FITTINGS FABRICATION

- A. Laterals and 90-degree Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards", 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in gauges specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards", Table 3-1.
 - b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
 - 1) 3 to 26 inches: 24-gauge.
 - 2) 27 to 36 inches: 22-gauge.
 - 3) 37 to 50 inches: 20-gauge.
 - 4) 52 to 60 inches: 18-gauge.
 - 5) 62 to 84 inches: 16-gauge.
 - c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:
 - 1) 3 to 14 inches: 24-gauge.
 - 2) 15 to 26 inches: 22-gauge.
 - 3) 27 to 50 inches: 20-gauge.
 - 4) 52 to 60 inches: 18-gauge.
 - 5) 62 to 84 inches: 16-gauge.
 - d. Flat Oval Mitered Elbows: Solid welded and with the same metal thickness as longitudinal seam flat oval duct.
 - e. 90-degree, 2-piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
 - 2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or $\frac{1}{2}$ " diameter (e.g. $3\frac{1}{2}$ - and $4\frac{1}{2}$ -inch) elbows with gored construction.
 - 3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or $\frac{1}{2}$ " diameter (e.g. $9\frac{1}{2}$ and $10\frac{1}{2}$ inch) elbows with gored construction.
 - 4. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored

elbows, except where space restrictions require a mitered elbow.

5. Die-formed Elbows for Sizes Through 8 Inches and All Pressures: 20-gauge with 2-piece welded construction.
 6. Round Gored Elbows Gauges: Same as for nonelbow fittings specified above.
 7. Flat Oval Elbows Gauges: Same as longitudinal seam flat oval duct.
 8. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26-gauge.
- D. Double-wall (Insulated) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal dimensions.
1. Thermal Conductivity: 0.27 Btu/square foot/degree F/inch thickness at 75°F mean temperature.
 2. Outer Shell: Base outer shell gauge on actual outer shell dimensions. Provide outer shell lengths 2" longer than inner shell and insulation. Gauges for outer shell shall be same as for uninsulated fittings specified above.
 3. Insulation: Unless otherwise indicated, provide 1" thick fiberglass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or noninsulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.
 4. Solid Inner Liner: Construct round and flat oval inner liners with solid sheet metal of the gauges listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
 - a. 3 to 34 inches: 24-gauge.
 - b. 35 to 58 inches: 22-gauge.
 - c. 60 to 88 inches: 20-gauge.
 5. Maintain concentricity of liner to outer shell by mechanical means. Protect insulation from discoloration by mechanical means.
- E. PVC-coated Elbows and Fittings: Fabricate elbows and fittings as follows:
1. Round Elbows 4 to 8 Inches: Two-piece, die stamped, with longitudinal seams spot welded, bonded, and painted with PVC aerosol spray.
 2. Round Elbows 9 to 26 Inches: Standing seam construction.
 3. Round Elbows 28 to 60 Inches: Standard gore construction, riveted and bonded.
 4. Other Fittings: Riveted and bonded joints.

5. Couplings: Slip-joint construction with a minimum of a 2-inch insertion length.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Install ducts with the fewest possible joints. Use fabricated fittings for all changes in directions, changes in size and shape, and connections. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- B. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct usable space or block access for servicing building and its equipment. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any. Install insulated ducts with 1-inch clearance outside of insulation. Conceal ducts from view in finished and occupied spaces 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.
- C. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures. Do not route ducts above electrical panel boards.
- D. Nonfire-rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1½ inches.

3.2 INSTALLATION OF FLEXIBLE DUCTS

- A. For any duct run using flexible ductwork, do not exceed 8'-0" extended length. Install in accordance with Section III of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".

3.3 PVC-COATED DUCT INSTALLATION

- A. Install PVC-coated duct and fittings in accordance with the manufacturer's instructions.
- B. Seal all joints and seams. Apply sealer to male end connectors before insertion, and afterwards to cover the entire joint and sheet metal screws.
- C. Secure couplings with sheet metal screws. Install screws at an interval of 12 inches, with a minimum of 3 screws in each coupling.
- D. Repair damage to PVC coating with a PVC aerosol spray.

3.4 HANGING AND SUPPORTING

- A. Install metal ducts with support systems indicated in SMACNA "HVAC Duct Construction Standards", tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 2' of each elbow and within 4' of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16' and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding $\frac{1}{4}$ of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Install concrete insert prior to placing concrete.
- F. Restraint of rigidly-mounted ductwork shall conform to SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Systems," SMACNA latest edition. Calculations need not be submitted for restraint systems conforming to these guidelines.

3.6 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Duct Accessories".
- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards", Figure 2-19.

3.7 FIELD QUALITY CONTROL

- A. Maximum Allowable Leakage: As described in ASHRAE 1989 Handbook, "Fundamentals" Volume, Chapter 32, Table 6 and Figure 10. Comply with requirements for leakage classification 3 for round and flat oval ducts, leakage classification 12 for rectangular ducts in pressure classifications less than and equal to 2" water gauge (both positive and negative pressures), and leakage classification 6 for pressure classifications greater than 2" water gauge and less than and equal to 10" water gauge.
- B. Reseal leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

3.8 ADJUSTING AND CLEANING

- 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.
- D. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION

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.

1.2 DESCRIPTION OF WORK

- A. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this Section. Types of ductwork accessories required for project include the following:
 - 1. Dampers:
 - a. Balancing dampers.
 - b. Control dampers.
 - c. Automatic backdraft dampers.
 - 2. Fire and smoke dampers.
 - 3. Turning vanes.
 - 4. Duct hardware.
 - 5. Duct access doors.
 - 6. Flexible connections.

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 three years.
- B. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
- C. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
- D. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
- E. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.
- F. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".

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.

PART 2 - PRODUCTS

2.1 DAMPERS

- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multi-blade 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 16-gauge steel, provide heavy-duty molded self-lubricating nylon bearings, ½" diameter steel axles spaced on 9" centers. Construct frame of 2" by ½" by c" steel channel for face areas 25 square feet and under; 4" by 1¼" by 16-gauge channel for face areas over 25 square feet. Provide galvanized steel finish with aluminum touch-up.
- C. Backdraft Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at 0.1" static pressure. Construct blades of 16-gauge aluminum, provide ½" diameter ball bearings, ½" diameter steel axles spaced on 9" centers. Construct frame of 2" by ½" by c" steel channel for face areas 25 square feet and under; 4" by one and 1¼" by 16-gauge channel for face areas over 25 square feet. Provide galvanized steel finish on frame with aluminum touch-up.
- D. Acceptable manufacturers include Air Balance, Inc.; Airguide Corp.; Arrow Louver and Damper; Greenheck; Louvers & Dampers, Inc.; Nailor; Penn Ventilator Co.; and Ruskin Mfg. Co.

2.2 FIRE AND SMOKE DAMPERS

- A. Fire Dampers: Construct casings of 20-gauge galvanized steel. Provide fusible link rated at 160EF to 165EF unless otherwise indicated. Dampers shall meet UL 555 qualifications. Provide damper with positive lock in closed position, and with curtain type damper blade assembly, with curtain 100% out of airstream and 24-gauge galvanized steel blades.
- B. Fire/Smoke Dampers: Construct casings of 20-gauge galvanized steel. Provide fusible link rated at 160EF to 165EF unless otherwise indicated. Provide additional frangible link containing explosive charge, connected in series with fusible link. Provide stainless steel spring loaded leakage seals in sides of casing, and 36" long wire leads for connecting smoke link to smoke detector, and low profile multi-formed 16-gauge galvanized steel blades.
- C. Ceiling fire dampers: Only all steel constructed air devices to be installed with this type of damper. Construct frame of 20-gauge galvanized steel. Provide fusible link rated at 160°F to 165°F unless otherwise indicated. Provide damper with positive lock in the closed position, and with single or butterfly damper blade assembly with UL Classified insulating mineral board and 22 gauge galvanized steel blades. Provide minimum ¼" thick ceramic insulating blanket as required by air device, and manufacturer's tested assembly. Ceiling damper based on Ruskin model CFD and CFDR with UL test assembly and sizes based on air device served. Damper may

be used as a volume damper for air devices with an approved UL tested assembly.

- D. Motor-Driven Fire/Smoke Dampers: Construct casing of 16-gauge galvanized steel, fusible link 160EF to 165EF multi-blade type. Damper manufacturer shall have tested, and listed with UL a complete range of damper sizes covering all combination fire/smoke dampers required by this specification. Electric operator shall be factory installed. Damper and operator shall be supplied as a single entity which must meet UL 555S qualifications. Damper shall be equal to Ruskin model FSD36 Class II.
 - 1. Damper electric operator shall be equal to Ruskin series MP2781 for duct sizes up to three square feet and series MA 418 for ducts above three square feet to 24 square feet.
 - 2. Each combination fire /smoke damper shall have pressure drops in the open position of less than 0.1 inch w.g. with average duct velocities of 2500 fpm.
- E. Acceptable manufacturers include Ruskin Mfg. Co., Air Balance, Inc.; Nailor, Greenheck; and Prefco Products, Inc.

2.3 TURNING VANES

- A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards" or provide manufactured turning vanes constructed of 1" wide curved blades set at ¾" 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. Acceptable manufacturers include Aero Dyne Co., Airsan Corp., Anemostat Products, Barb-Aire Co., Duro Dyne Corp., Environmental Elements Corp., Hart & Cooley Mfg. Co., and Register & Grille Mfg. Co., Inc.

2.4 DUCT HARDWARE

- A. Provide duct hardware manufactured by one manufacturer for all items on project.
- B. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
- C. Acceptable manufacturers include Elgen Manufacturing, Ventfabrics, Inc., and Young Regulator Co.

2.5 DUCT ACCESS DOORS

- A. Construct access doors of the same or greater gauge as ductwork served, provide 1" thick insulated doors for insulated ductwork. Provide flush frames for uninsulated

ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type cam latch for all doors. If space is limited for a hinged door swing, then provide a two handle-type cam latch door. Installation of door shall be accessible, and the size opening shall be large enough to permit maintenance and resetting of device the door serves.

- B. Acceptable manufacturers include Air Balance Inc., Louver & Dampers, Inc., and Ruskin Mfg. Co.

2.6 FLEXIBLE CONNECTIONS

- A. 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. Acceptable manufacturers include American/Elgen Co., Duro Dyne Corp., Flexaust Co., and 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 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. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.
- B. Install turning vanes in square or rectangular 90° elbows in supply 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. Provide access doors at all duct mounted smoke detectors, fire dampers, smoke/fire dampers and other locations where routine maintenance will be required.
- D. Combination Fire/Smoke Dampers:
 - 1. Each combination fire/smoke damper shall be installed in accordance with the conditions of their listing and the manufacturer's installation instructions.
 - 2. Provide wall sleeves. Thickness of sleeves shall not be less than the

conditions of rating under UL 555S, standard for fire dampers and ceiling dampers. Provide an expansion gap between the fire rated wall opening and the fire/smoke damper sleeve. The gap shall be sized at c" per linear foot in both dimensions.

3. Smoke seal retaining angles by providing a bead of acoustic sealant or UL rated caulking on the edge of retaining angle at the wall.
- E. Install 2 ft long orange plastic strips at all volume dampers to aid in easy identification of locations. These strips are to remain after construction.

3.3 FIELD QUALITY CONTROL

- A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.

3.4 ADJUSTING AND CLEANING

- A. Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
- B. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 EXTRA STOCK:

- A. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range.

END OF SECTION

SECTION 23 34 16 - AIR HANDLING

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 this Section.

1.2 SUMMARY

- A. This Section includes the following types of air-handling units:
 - 1. Centrifugal fans.
 - 2. Utility set fans.
 - 3. Tubular centrifugal fans.
 - 4. In-line centrifugal fans.
 - 5. Power ventilators: roof- and wall-mounted exhausters.
 - 6. Ceiling-mounted ventilators.
 - 7. Propeller fans.
 - 8. Vane-axial fans.
 - 9. Kitchen exhaust/ventilation hood.
 - 10. Intake or exhaust hoods.
- B. Products furnished but not installed under this Section include roof curbs for roof-mounted exhaust fans.

1.3 SUBMITTALS

- A. Product Data: Submit product data including performance curves with system operating conditions; sound power ratings; motor ratings and electrical characteristics, plus data for motor and fan accessories; materials, gauges and finishes, including color charts; and data for dampers, including housings, linkages, and operators.
- B. Shop Drawing: Submit shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.
- C. Wiring Diagrams: Submit manufacturer's wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.
- D. Maintenance data for fans, for inclusion in Operating and Maintenance Manual.

1.4 QUALITY ASSURANCE

- A. UL Compliance: Fans shall be designed, manufactured, and tested in accordance with UL 705 "Power Ventilators." Fans and components shall be UL listed and labeled.

- B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70-1990 "National Electrical Code".
- D. Fan shall bear the AMCA certified ratings seal for air performance.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.
- B. Coordinate the installation of roof curbs, equipment supports, and roof penetrations specified.
- C. Coordinate the size and location of structural steel support members.

PART 2 - PRODUCTS

2.1 FANS GENERAL

- A. Acceptable manufacturers include: Bayley Fan Group, Penn Ventilators, Cook (Loren) Co., Greenheck Fan Corp., ILG Industries, Jenn Industries, Twin City Fan and Blower Co., Carnes Co., and Acme Engineering and Manufacturing Corp.
- B. Provide fans that are factory fabricated and assembled, factory tested, and factory finished. Fans and shafts shall be statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower. Fan shafts shall be turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan's class. Shaft bearings shall have a median life "Rating Life" (AFBMA L⁵⁰) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.
- C. Provide Factory-mounted belt drives, with final alignment and belt adjustment made after installation and service factory of 1.4. Include oil-resistant, nonsparking, and nonstatic belts. Motors and fan wheel pulleys shall be adjustable pitch for use with motors through 15 HP; fixed pitch for use with motors larger than 15 HP. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions. Provide steel belt guards for motors mounted on the outside of the fan cabinet.
- D. Provide prime coating for sheet metal parts prior to final assembly, and baked-enamel finish coat after assembly for exterior surfaces of sheet metal parts.
- E. All polyphase motors shall be of the premium efficiency type, with nominal efficiency equal to or greater than that stated in NEMA MG 1, Table 12-12 for that type and rating of motor.

2.2 CENTRIFUGAL FANS - INTERIOR

- A. Housings shall be fabricated from formed and reinforced galvanized steel panels to form curved scroll housings with continuously welded or deep-locked seams and access doors or panels to allow access to internal parts and components. Include flanged connections, and steel angle or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories. Fan wheels shall be single-width, or double width, double inlet, single-inlet, welded to cast-iron or cast-steel hub and spun steel inlet cone, with hub keyed to the shaft, and steel blades. Include grease-lubricated, self-aligning, pillow-block type shaft bearings; tapered roller bearings with double-locking collars and two-piece, cast-iron housing.
- B. The following accessories are required where indicated:
 - 1. Inlet Screens: Heavy wire mesh screens, mounted inside of shaft bearings.
 - 2. Discharge Dampers: Heavy-gauge steel, opposed blade design, with linkage for manual or automatic operation.
 - 3. Drain Connections: Threaded, $\frac{3}{4}$ " NPS, capped nipple installed at lowest point of housing.
 - 4. Shaft Cooler: Metal disc between bearings and fan wheel, designed to dissipate heat from shaft.
 - 5. Spark-Resistant Construction: AMCA construction option A, B, or C as indicated.
 - 6. Shaft Seals: Air-tight seals installed around shaft on drive side of single-width fans.

2.3 IN-LINE CENTRIFUGAL FANS

- A. Housings shall be split, spun-aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting. Fan wheels shall be aluminum, with aluminum airfoil blades welded to aluminum hub. For direct-drive units motor shall be encased in housing out of air stream, factory-wired to disconnect located on outside of fan housing. For belt-drive units motor shall be mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- B. The following accessories are required as indicated:
 - 1. Volume Control Damper: Manual operated with quadrant lock, located in fan outlet.
 - 2. Companion Flanges: For inlet and outlet duct connections.
 - 3. Fan Guards: Expanded metal in removable frame.
 - 4. Speed Control: Variable speed switch with on-off control and speed control for 100 to 50 percent of fan air deliver for direct drive fans when shown on drawings.

2.4 CEILING-MOUNTED VENTILATORS

- A. Provide galvanized steel housing lined with acoustical insulation. Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall

be removable for service. Include standard grille with flange on intake and screw attachment to fan housing. Provide junction box for electrical connection on housing and receptacle for motor plug-in. Provide solid state remote fan speed control, capable of controlling fan speed from full speed to approximately half speed as indicated.

- B. Accessories: Manufacturer's standard roof jack, wall cap, and transition fittings as indicated.

2.5 MOTORS

- A. Motors shall have sufficient torque to accelerate the driven loads satisfactorily. Minimum sizes and electrical characteristics as indicated. If not indicated, large enough so that the driven load will not require the motor to operate in the service factor range. Service factor shall be 1.15 for poly-phase motors and 1.35 for single-phase motors. Motors shall be rated for 50°C maximum temperature rise at 40°C ambient for continuous duty at full load (Class A Insulation). Use Class B, 90°C maximum temperature rise in hot locations.
- B. Motor construction shall comply with NEMA Standard MG 1, general purpose, continuous duty, Design B. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans. Provide adjustable bases. Bearing shall be ball or roller type with inner and outer shaft seals, grease lubricated, and designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor. Provide open drip-proof motors where satisfactorily housed or remotely located during operation. Provide guarded drip-proof motors where exposed to contact by employees or building occupants. Motors shall have built-in, automatic reset, thermal overload protection, and be designed for quiet operation. Energy-efficient motors are required and shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, Test Method B. Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.
- C. Electrical devices and connections are specified in Division 26.

2.6 ROOF INTAKE OR EXHAUST HOODS

- A. Gravity roof ventilators shall be constructed of heavy gauge aluminum or galvanized steel.
- B. Hoods shall be constructed of formed, arched panels with interlocking seams.
- C. Bases shall be constructed so that the curb cap is 8" larger than the throat size. Base height shall be 12" bases shall be furnished.
- D. Hood support members shall be constructed of galvanized steel and fastened so that the hood can be either removed completely from the base or hinged open.
- E. Bird screens constructed of ½" galvanized steel mesh shall be mounted horizontally across the intake/discharge area of the hood.

- F. Gravity hoods shall be for intake or relief as manufactured by Greenheck, Cook, Carnes, Penn or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install fans level and plumb, in accordance with manufacturer's written instructions. Arrange installation of units to provide access space around air-handling units for service and maintenance.
- B. Support floor-mounted units, less than 18" diameter, on concrete equipment bases using neoprene pads. Secure units to anchor bolts installed in concrete equipment base.
- C. Support floor-mounted units, 18" diameter or larger, on concrete equipment bases using housed spring isolators. Secure units to anchor bolts installed in concrete equipment base.
- D. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
- E. Support suspended units from structural support frame using threaded steel rods and vibration isolation springs.
- F. Make final duct connections with flexible connections.
- G. Connect unit components to ground in accordance with the National Electrical Code.

3.3 EQUIPMENT BASES

- A. Construct equipment base 4" larger in both directions than the overall dimensions of the supported unit. Form concrete pads with framing lumber with form release compounds. Chamfer top edge and corners of pad. Install reinforcing bars, tied to frame, and place anchor bolts and sleeves to facilitate securing units. Place concrete and allow to cure before installation of units. Use Portland Cement conforming to ASTM C 150, 4,000 psi compressive strength, and normal weight aggregate.

3.4 ADJUSTING, CLEANING, AND PROTECTING

- A. Adjust damper linkages for proper damper operations.
- B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.5 COMMISSIONING

- A. Prior to start-up of units, check fan rotation, lubricate moving parts and verify unit is secure on mountings. Verify fire and smoke dampers in connected ductwork are in fully open position. Disable automatic temperature control operators.
- B. At unit start-up, energize motor and verify proper operation of unit. Replace fan and motor pulleys as required to achieve design conditions. Shut unit down and reconnect automatic temperature control operators.
- C. Provide start-up supervision and performance check by the kitchen hood manufacturer's authorized representative. All systems are to be field balanced.

END OF SECTION

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 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 five years.
- B. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
- C. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A-2015 "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.3 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.

PART 2 - PRODUCTS

2.1 DIFFUSERS, GRILLES, REGISTERS AND LOUVERS

- A. Ceiling Diffusers: Rectangular louvered face, aluminum construction, baked white enamel finish, fixed, throw pattern and rectangular or round neck as shown on plan. All units shall be provided with lever operated opposed blade damper in throat (Titus AG-95). Provide 2'x 2' lay-in panel for T-bar ceilings. Provide beveled drop face (Titus border 6) for drywall or plaster ceilings. Titus TDC or approved equal.
- B. Return or exhaust grilles and registers: Rectangular louvered face, 35° or 45° fixed blades on ½-inch centers, all aluminum construction, white baked enamel finish. Blades shall be horizontal in wall-mounted applications and run the short dimension in ceiling applications. Provide opposed blade dampers in registers (Titus AG-15). Delete screw holes for lay-in ceiling applications and provide 2' X 2' lay-in panel. Provide gasket around frame for drywall or plaster installation. Titus model 355FL or approved equal.
- C. Supply grilles or registers: Rectangular louvered face, double deflection, ¾-inch blade spacing, all adjustable, aluminum construction, white baked enamel finish.

Front blades shall run the short direction. Titus model 300FS or approved equal.

- D. For fire-rated ceilings, provide diffusers of steel construction to match standard diffusers. Provide radiation blanket and fire damper with air volume adjustment option.
 - 1. Louvered face diffusers shall be Titus TDCT-FR with adjustment option or approved equal.
 - 2. Perforated face diffusers shall be Titus PCS with Ruskin model CFD damper with air volume adjustment or approved equal. Mount damper in strict accordance with manufacturer's recommendation.
- E. Approved manufacturers of grilles and diffusers: Titus, Krueger, Nailor, Metal-Aire, or Carnes, subject to compliance with specification.
- F. Louvers: 6-inch deep, drainable, fixed 35E blade, mill-finished extruded aluminum, minimum 0.081 inch thick blades, high free area with $\frac{3}{4}$ " x $\frac{1}{2}$ " aluminum bird screen. Unit shall have a water penetration rate of 0.05 ounces per square foot of free area or less at 1000 fpm. Air pressure drop shall be less than 0.1 inch w.g. at 800 fpm. Provide flanged frame where required and anodized finish or insect screen where shown on plan. Louver must have current Miami-Dade County, Florida notice of acceptance number. Ruskin ELF637DXD or approved equal by Arrow, Carnes, Louvers & Dampers, Inc., or Vent Products.

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. 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, three operating keys for each type of air outlet and inlet.

END OF SECTION

SECTION 23 64 23 - AIR-COOLED WATER CHILLERS

PART 1 - GENERAL

1.1 SCOPE

- A. Section includes design, performance criteria, controls and control connections, chilled water connections, electrical power connections and refrigerants of the chiller package.

1.2 REFERENCES

- A. Products shall be designed, rated and certified in accordance with applicable sections of the following Standards and Codes:
 - 1. To comply with the most recent versions of applicable Standards and Codes of AHRI 550 / 590.
 - 2. AHRI 370 - Standard for Sound Rating of Large outdoor Refrigerating and Air-conditioning Equipment.
 - 3. To comply with the most recent versions of applicable Standards and Codes of ASHRAE 15.
 - 4. Units shall meet the efficiency standards of the latest ASHRAE 90.1 Standard.

1.3 QUALITY ASSURANCE

- A. UL 1995 -- Standard for Heating and Cooling Equipment.
- B. Manufactured facility to be ISO 9001.
- C. Factory Functional Test: The chiller shall be pressure tested, evacuated and fully charged with HFC-410A refrigerant and oil. In addition, a factory functional test to verify correct operation by cycling condenser fans, closing compressor contacts and reading data points from temperature and pressure sensors.
- D. Chiller manufacturer shall have a factory trained and supported service organization that is within a 75 mile radius of the site.
- E. Warranty: The manufacturer shall warrant all equipment and material of its manufacture against defects in workmanship and material for a period of one year from date of initial start-up or eighteen months from date of shipment; whichever occurs first.

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with the specifications.
- B. Submittals shall include the following:

1. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections.
2. Product data indicating rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

1.5 OPERATION AND MAINTENANCE DATA

- A. Include manufacturer's descriptive literature, installation checklist, start-up instructions and maintenance procedure.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Units shall be delivered to job site fully assembled and charged with refrigerant (unless selected with nitrogen charge) and oil by the manufacturer.
- B. Unit shall be stored and handled per manufacturer's instructions.
- C. During shipment, provide protective covering over vulnerable components. Fit nozzles and open pipe ends with enclosures.

1.7 ENVIRONMENTAL REQUIREMENTS

1.8 WARRANTY

- A. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- B. A 5-year motor/transmission/compressor warranty shall be provided based upon the RPM of the compressors as follows:

Compressor RPM	Warranty Term
0 - 5000	1 year from start-up
5001 - 10,000	5 years from start-up
10,001 and above	5 years plus annual oil analysis

- C. OEM provides several Extended Warranty options to include:

1. Whole Units Parts Warranty (Year 2 plus)
2. Compressor Parts
3. Whole Unit Labor Warranty (Year 1 plus)
4. Compressor Warranty Option
5. Refrigerant Warranty Option

1.9 MAINTENANCE SERVICES

- A. All inspections and service of units shall be accomplished by factory trained and authorized servicing technicians.

- B. In conjunction with and supporting Factory warranty OEM shall furnish complete factory authorized service and maintenance of Applied Chillers for 10 years from Date of Substantial Completion.
- C. OEM shall provide and report quarterly, annual, and bi-annual maintenance in compliance with or better than ASHRAE Standard 180-2008.
- D. Include maintenance items as recommended in manufacturer's operating and maintenance data.
- E. Submit copy of service call work orders and summary report to the Owner, including description of work performed, operating performance status and noted exceptions.

1.10 LIFE CYCLE COST

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Trane, Carrier, York, Daiken

2.2 GENERAL UNIT DESCRIPTION

2.2.1 CARRIER GUIDE SPECIFICATIONS

Part 1: General

SYSTEM DESCRIPTION

- 1.1. Microprocessor controlled, air-cooled liquid chiller for outdoor installation, utilizing scroll compressors, low sound fans, electronic expansion valve, optional hydronic pump system, and fluid storage tank (storage tank on models 010-060 only).
- 1.2. With Greenspeed intelligence, all fans are controlled with variable speed fan drive motors. Chiller software shall be specifically developed to coordinate optimal fan speed for application conditions and provide refrigerant circuit optimization, resulting in higher part load efficiency and reduced acoustic levels.

QUALITY ASSURANCE

- 1.1. Unit shall be rated in accordance with AHRI (Air- Conditioning, Heating and Refrigeration Institute) Standard 550/590, latest edition (U.S.A.) and all units shall be ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 90.1 compliant.
- 1.2. Unit construction shall comply with ASHRAE 15 Safety Code, UL latest edition, and ASME (American Society of Mechanical Engineers) applicable codes (U.S.A. codes).
- 1.3. Unit shall be manufactured in a facility registered to ISO 9001 Manufacturing Quality Standard.

- 1.4. Unit shall be full load run tested at the factory.

DELIVERY, STORAGE AND HANDLING

- 1.1. Unit controls shall be capable of withstanding 150 F (66 C) storage temperatures in the control compartment.
- 1.2. Unit shall be stored and handled per unit manufacturer's recommendations.

Part 2: Products

EQUIPMENT

2.1. General:

- A. Factory assembled, single-piece chassis, air-cooled liquid chiller. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R-410A), and special features required prior to field start-up.

2.2. Unit Cabinet:

- A. Frame shall be of heavy-gage, galvanized steel.
- B. Exterior panels shall be galvanized steel with a baked enamel powder or pre-painted finish.
- C. Cabinet shall be capable of withstanding 500-hour salt spray test in accordance with the ASTM (American Society for Testing and Materials, U.S.A.) B-117 standard.

2.3. Fans:

- A. Standard condenser fans shall be direct-driven, 9-blade airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
- B. Standard condenser fans shall be direct-driven (VFD [variable frequency drive] controlled on units with Greenspeed intelligence), 9-blade airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
- C. The variable speed drives for the condenser fans on 30RAP units with Greenspeed intelligence shall include a DC link reactor.
- D. Fan operation shall allow reduced sound levels during scheduled unoccupied operating periods. Manufacturers without unoccupied reduced sound capability shall submit 1/3 octave band data and sound power data as measured according to AHRI 370 as confirmation of unit sound characteristics.
- E. Air shall be discharged vertically upward.

F. Fans shall be protected by coated steel wire safety guards.

2.4. Compressor/Compressor Assembly:

A. Fully hermetic, direct-drive, scroll type compressors.

B. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.

C. Compressors shall be mounted on rubber in shear vibration isolators.

D. Staging of compressors shall provide unloading capability. Digital compressor unloading control shall be available as an option (sizes 010-090 only).

E. Crankcase heaters are not required on sizes 010-060 due to very low refrigerant charge.

2.5. Cooler:

A. Cooler shall be rated for a refrigerant working-side pressure of 565 psig (3896 kPa) and shall be tested for a maximum waterside pressure of 300 psig (2068 kPa) or 150 psig (1034 kPa) when optional hydronic package is installed.

B. Shall be single-pass, ANSI (American National Standards Institute) type 316 stainless steel, brazed plate construction.

C. Shell shall be insulated with 3/4-in. (19 mm) closed-cell, polyvinyl-chloride foam with a maximum K factor of 0.28.

D. Shall incorporate 2 independent refrigerant circuits.

E. Cooler shall have optional factory-installed heater, to protect cooler from ambient temperature freeze down to -20 F (-29 C).

F. Unit shall be provided with a factory-installed flow switch.

G. All connections shall use standard Victaulic-type fittings.

H. Cooler fluid inlet line shall have a 40 mesh strainer just ahead of the cooler.

2.6. Condenser:

A. Coil shall be air-cooled Novation® heat exchanger technology with microchannel (MCHX) coils and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds.

- B. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a corrosion-resistant coating.
- C. Tubes shall be cleaned, dehydrated, and sealed.
- D. Assembled condenser coils shall be leak tested and pressure tested at 656 psig (4522 kPa).

2.7. Refrigeration Components:

- A. Refrigerant circuit components shall include filter drier, moisture indicating sight glass, electronic expansion device, and complete operating charge of both refrigerant R-410A and compressor oil.

2.8. Controls, Safeties, and Diagnostics:

- A. Unit controls shall include the following minimum components:
 1. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
 2. Separate terminal block for power and controls.
 3. Control transformer to serve all controllers, relays, and control components.
 4. ON/OFF control switch.
 5. Replaceable solid-state controllers.
 6. Pressure sensors shall be installed to measure suction and discharge pressure for each circuit. Thermistors shall be installed to measure cooler entering and leaving fluid temperatures, outdoor ambient temperature, and suction temperature. Provision for field installation of accessory sensor to measure compressor return gas temperature.
- B. Unit controls shall include the following functions:
 1. Automatic circuit lead/lag for dual circuit chillers.
 2. Hermetic scroll compressors are maintenance free and protected by an auto-adaptive control that minimizes compressor wear.
 3. Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return-fluid temperature with temperature set point accuracy to 0.1°F (0.06°C).
 4. Limiting the chilled fluid temperature pulldown rate at start-up to an adjustable range of 0.2°F to 2°F (0.11°C to 1.1°C) per minute to prevent excessive demand spikes at start-up.
 5. Seven-day time schedule.
 6. Leaving chilled fluid temperature reset from return fluid and outside air temperature.
 7. Chilled water pump start/stop control and primary/standby sequencing to ensure equal pump run time.
 8. Dual chiller control for parallel chiller applications without addition of hardware modules and control panels (additional thermistors and wells are required).

9. Timed maintenance scheduling to signal maintenance activities for pumps, condenser coil cleanings, strainer maintenance and user-defined maintenance activities.
10. Boiler enable signal to initiate system heating mode.
11. Low ambient protection to energize cooler and hydronic system heaters.
12. Periodic pump start to ensure pump seals are properly maintained during off-season periods.
13. Single step demand limit control activated by remote contact closure.
14. Nighttime sound mode to reduce the sound of the machine by a user-defined schedule.

C. Diagnostics:

1. The control panel shall include, as standard, a scrolling marquee display capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display.
2. Information included for display shall be:
 - a. Compressor lockout.
 - b. Loss of charge.
 - c. Low fluid flow.
 - d. Cooler freeze protection.
 - e. Cooler set point.
 - f. Chilled water reset parameters.
 - g. Thermistor and transducer malfunction.
 - h. Entering and leaving-fluid temperature.
 - i. Compressor suction temperature.
 - j. Evaporator and condenser pressure.
 - k. System refrigerant temperatures.
 - l. Chiller run hours.
 - m. Compressor run hours.
 - n. Compressor number of starts.
 - o. Low superheat.
 - p. Time of day:
 - I) Display module, in conjunction with the microprocessor, must also be capable of displaying the output (results) of a service test. Service test shall verify operation of every switch, thermistor, fan, and compressor before chiller is started.
 - II) Diagnostics shall include the ability to review a list of the 20 most recent alarms with clear language descriptions of the alarm event. Display of alarm codes without the ability for clear language descriptions shall be prohibited.
 - III) An alarm history buffer shall allow the user to store no less than 20 alarm events with clear language descriptions, time and date stamp event entry.
 - IV) The chiller controller shall include multiple connection ports for communicating with the local equipment network, the Carrier Comfort Network® (CCN) system and access to chiller control functions from any point on the chiller.
 - V) The control system shall allow software upgrade without the need for new hardware modules.

D. Safeties:

1. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:
 - a. Loss of refrigerant charge.
 - b. Reverse rotation.
 - c. Low chilled fluid temperature.
 - d. Thermal overload.
 - e. High pressure.
 - f. Electrical overload.
2. Factory pump motors shall have external overcurrent protection.

2.9. Operating Characteristics:

- A. Unit shall be capable of starting and operating down to 32 F (0° C) as standard.
- B. Unit shall be capable of starting and running at outdoor ambient temperatures up to 120 F (50 C) for all sizes. Unit shall additionally be able to stay online when running with a 125 F (52 C) ambient temperature.
- C. Unit shall be capable of starting up with 95 F (35 C) entering fluid temperature to the cooler.

2.10. Fan Motors:

- A. Condenser fans shall be direct-drive Aero- Acoustic™ type, discharging air vertically upward.
- B. All condenser fan motors shall be totally enclosed 3-phase type with permanently lubricated ball bearings, Class F insulation and internal, automatic reset thermal overload protection or manual reset calibrated circuit breakers.
- C. Shafts shall have inherent corrosion resistance.
- D. Fan blades shall be statically and dynamically balanced.
- E. Condenser fan openings shall be equipped with PVC coated steel wire safety guards.

2.11. Electrical Requirements:

- A. Unit/module primary electrical power supply shall enter the unit at a single electrical box.
- B. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
- C. Control points shall be accessed through terminal block.
- D. Unit shall be shipped with factory control and power wiring installed.

2.12. Chilled Water Circuit:

- A. Chilled water circuit shall be rated for 150 psig (1034 kPa) working pressure.
- B. Solid-state flow monitor with integral relay shall be factory installed and wired.
- C. Brass body strainer with 40 mesh screen and ball type blow down.
- D. Optional hydronic package:
 - 1. Field pipe connections shall be copper Victaulic type.
 - 2. Optional single or primary/stand-by operation pump systems. Dual pump systems shall have a pump discharge check valve.
 - 3. Pumps shall be single stage design, capable of being serviced without disturbing piping connections.
 - a. Pump casing shall be of class 30 cast iron.
 - b. The impeller shall be of cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking cap screw.
 - c. The hydronic kit will be provided with a flush line connection to ensure lubrication at the seal face and allow for positive venting of the seal chamber.
 - d. Pump shall be rated for 150 psig (1034 kPa) working pressure.
 - e. The pump case shall have gage tapings at the suction and discharge nozzles and include drain ports.
 - f. Motors shall totally enclosed 3-phase type with grease lubricated ball bearings.
 - g. Each pump shall be factory tested per Hydraulic Institute Standards.
 - h. Pump motors shall be VFD compatible.
 - 4. Water pressure taps (2) shall be factory installed across the cooler and rated for 150 psig (1034 kPa).
 - 5. Balancing valve shall be factory installed to set flow gage ports shall be factory-installed and rated for 300 psig (2068 kPa).
 - 6. Hydronic assembly shall have factory-supplied electric freeze protection to -20 F (-29 C) when optional heaters are used.
 - 7. Piping shall be type-L seamless copper tubing.

2.13. Special Features:

- A. High-Efficiency Variable Condenser Fans:
 - 1. All fans on the unit shall have variable speed fan motors to provide higher part load efficiency and reduced acoustic levels. Each fan circuit shall have a factory-installed, independent variable speed drive with display. Variable speed drives are rated IP-55 enclosures and UL Listed. The use of this option, with the addition of antifreeze in the cooler circuit and wind baffles, shall allow running with outdoor ambient temperatures down to -20 F (-28.9 C). This option is a standard feature on sizes 011 and 016, is not available on sizes 010,

015, and 070-150, and is not available in combination with low ambient head pressure control.

- B. Unit-Mounted Non-Fused Disconnect:
 - 1. Unit shall be supplied with factory-installed, non-fused electrical disconnect for main power supply. For unit sizes 070 and larger, this option is available only with single-point power. Additionally, on sizes 100-150, this option is not available with 208/230 volts.
- C. Optional Condenser Coil Materials:
 - 1. E-coated microchannel coils:
 - a. E-coated aluminum microchannel coil shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges. E-coat shall have a thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas including fin edges. E-coated coils shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross hatch adhesion of 4B-5B per ASTM D3359-02. Impact resistance shall be up to 160 in./lb (ASTM D2794-93). E-coated coil shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2. E-coated aluminum microchannel coils shall be capable of withstanding an 8,000-hour salt spray test in accordance with the ASTM (American Society for Testing and Materials) (U.S.A.) B-117 Standard.
- D. BACnet Communication Option:
 - 1. Shall provide factory-installed communication capability with a BACnet MS/TP network. Allows integration with i-Vu® Open control system or a BACnet building automation system.
- E. Freeze Protection Cooler Heaters:
 - 1. Cooler heaters shall provide protection from cooler freeze-up to -20 F (-29 C) 60 Hz and -15 F (-26 C) 50 Hz.
- F. Ultra-Low Sound:
 - 1. Shall provide sound blankets around each compressor in conjunction with low-sound AeroAcoustic™ fans to provide significant chiller sound reduction.
- G. Digital Compressor Option:
 - 1. Shall provide a factory-installed digital compressor to provide incremental steps for tighter temperature control (not available on any application with a leaving fluid temperature below 35 F [2 C]).

2.3 HYDRONIC PACKAGE

- A. Field pipe connections shall be copper Victaulic type.

- B. Primary/stand-by operation pump systems. Dual pump systems shall have a pump discharge check valve.
- C. Pumps shall be single stage design, capable of being serviced without disturbing piping connections.
 - 1. Pump casing shall be of class 30 cast iron.
 - 2. The impeller shall be of cast bronze, closed type, dynamically balanced, keyed to the shaft and secured by locking capscrew.
 - 3. The hydronic kit will be provided with a flush line connection to ensure lubrication at the seal face and allow for positive venting of the seal chamber.
 - 4. Pump shall be rated for 150 psig (1034 kPa) working pressure.
 - 5. The pump case shall have gage tappings at the suction and discharge nozzles and include drain ports.
 - 6. Motors shall totally enclosed 3-phase type with grease lubricated ball bearings.
 - 7. Each pump shall be factory tested per Hydraulic Institute Standards.
 - 8. Pump motors shall be VFD compatible.
- D. Water pressure taps (2) shall be factory installed across the cooler and rated for 150 psig (1034 kPa).
- E. Balancing valve shall be factory installed to set flow gage ports shall be factory-installed and rated for 300 psig (2068 kPa).
- F. Hydronic assembly shall have factory-supplied electric freeze protection to -20 F (-29 C) when optional heaters are used.
- G. Piping shall be type-L seamless copper tubing.

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 SCHEDULE

3.3 MANUFACTURER'S FIELD SERVICES

- A. OEM Startup is performed by factory trained and authorized servicing technicians confirming equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty.
 - 1. Included OEM Factory Startup: Centrifugal, Rotary Screw, and Scroll Chillers

- B. Applied Chiller manufacturers shall maintain service capabilities no more than 4 miles from the jobsite.
- C. The manufacturer shall furnish an alternative price for:
 - 1. Extended compressor warranty for 10years.
- D. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

PART 4 - SEQUENCE OF OPERATIONS

4.1 SEQUENCE OF OPERATION

4.2 POINTS LIST

END OF SECTION

SECTION 23 73 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.

1.2 DESCRIPTION OF WORK

- A. Extent of air handling unit work is indicated on drawings and schedules, and by requirements of this Section.
- B. Provide control wiring as work of this Section, complying with requirements of Division 26; power wiring shall be by Division 26.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of packaged air handling units with characteristics, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than five years.
- B. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
- C. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", display certification symbol on units of certified models.
- D. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
- E. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A-1989 "Standard for the Installation of Air Conditioning and Ventilating Systems".
- F. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA Standards.
- G. Comply with the latest approved edition of the "Florida Energy Code for Building Construction".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air handling units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions.

- B. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, weight loadings, required clearances, construction details, and field connection details.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers are Dunham Bush, Carrier Air Conditioning Co., McQuay, Inc., Trane (The) Co., and York.

2.2 AIR HANDLING UNITS

- A. Construct casings of 18-gauge minimum mill galvanized steel, designed to withstand specific operating pressures. Provide casing panels and/or access doors that are easily and quickly removable for inspection and access to internal parts. Cover casing and frame with protective finish on both sides. Provide reinforced points of support for either setting or hanging units. Provide indoor air quality pitched drain pan with minimum slope of c" per 1'-0", located under cooling coil section and humidifier section, extensive enough to catch condensate leaving coil at highest catalogued face velocity. Provide at least one drain connection at low point in drain pan. Unit to have double-wall construction with solid interior panel and 1½ pound density insulation. Unit components to be modular type.
 - 1. Provide single zone units consisting of fan section, coil section, adjustable fan motor mounting, and drain pan.
 - 2. Provide multizone units consisting of single zone components, diffuser section, damper section, zoning dampers, and balancing plate when required to equalize resistances through cooling and heating passes.
- B. Insulate unit casing from air entrance to coils to air outlet from unit, including bypass duct if unused. Insulate framing angles exposed to air stream. Securely attach insulation, of sufficient thickness and density to prevent condensation from forming on unit casing. Protect insulation against deterioration from air currents. Provide insulation with fire-retarding characteristics, complying with NFPA 90A-1989. Insulate drain pans as required to prevent condensate formation on unit exterior at ambient conditions to be encountered.
- C. Provide fans with adjustable motor base, adjusted with mounting bolts, to provide variation in center distance. Provide locking nuts, or similar devices, to secure base in proper position. Provide belt-driven fans with adjustable pitch pulley. Select pulley for midpoint of adjustable range. Design fan shafts so as not to pass through first critical speed when unit comes up to rated RPM. Provide grease-lubricated fan bearings with externally accessible fittings for lubrication. Statically and dynamically balance fan assemblies in fan housing after final assembly.
- D. All polyphase motors shall be of the premium efficiency type, with nominal efficiency equal to or greater than that stated in NEMA MG 1, Table 12-12 for that type and rating of motor.

- E. Design internal structure of coil section to allow for removal of coils, and provide suitable baffles to assure no air bypass around coils. Insulate coil section casings and drain pans as specified in "Insulation" paragraph. For reheat coils, make provisions to allow simultaneous dehumidification and reheating at maximum cooling face velocity catalogued by manufacturer.
- F. Construct cooling units with copper tubing primary surface and aluminum secondary surface bonded to tubes by method approved by specified by manufacturer. Provide chilled water and heating coils with threaded connections. Provide chilled water coils with drain and vent connections. Provide direct expansion coils with solder connections, liquid refrigerant distributors, and connections for gravity oil drainage. Provide steam coil as either single tube standard type, or double tube steam distribution type in accordance with schedule. Pitch coils in unit casing for drainage, and mount to allow removal.
- G. Provide electric heating coil with automatic reset thermal cutouts for primary over-temperature protection and with load-carrying manual reset thermal cutouts, factory-wired in series with each heater stage, for secondary protection. Include over-current cutouts and sub-circuit fusing in assembly. Construct coils with resistance wire of 80% nickel/20% chromium, insulated by floating ceramic bushings. Recess bushings into casing openings and secure on supporting brackets, spaced 4" o.c. maximum.
- H. Provide multi-blade face and bypass dampers as scheduled, rotating in sintered bronze or nylon bearings, with both sets of dampers encased in single sturdy frame. Secure damper blades in correct position, and provide sealing edges. Connect damper shafts together with one continuous linkage bar. Arrange dampers for parallel blade operation.
- I. Zoning Damper Sections: Provide zoning damper sections for multi-zone units, furnished with series of equal-sized discharge openings, each with set of dampers to regulate air flow from heating pass and cooling pass. Permanently secure damper blades in correct position on single shaft, rotating in sintered bronze or nylon bearings, and extend either upward or downward for connection to damper motor. Provide sealing edges on damper blades, or close against sealing stops. Connect damper shafts together with one continuous linkage bar which may be cut in field to separate dampered openings into groupings as required. Provide damper section capable of either horizontal or vertical air discharge, factory-installed for orientation indicated.
- J. Provide replaceable pleated media type air filters, 2" thick. Provide filters with clean resistance not exceeding 0.10" w.g. at face velocity of 300 fpm, and ASHRAE weight arrestance efficiency of 30%. Provide filter boxes with either hinged access doors or quickly removable panels, at each end. Provide racks to receive filters in either flat or angle type pattern. Provide Dwyer Series 3000 photohelic gauge with switch to indicate differential air pressure across filter.
- K. Contractor shall be solely responsible for furnishing and installing smoke detectors where a fire detection system is not existing or part of this project. Where smoke detectors are indicated on the drawings, the location of the smoke detectors shall be in compliance with the manufacturer's installation instructions. Smoke detectors

shall be UL listed and shall be furnished complete with remote visual and audible indicators and an access door adequate for inspecting and maintaining the smoke detector.

2.3 AIR HANDLING UNITS (RESIDENTIAL)

- A. Construct casings of enamel finished steel insulated with 1" fiberglass. Provide casing panels that are easily and quickly removable for inspection and access to internal parts.
- B. Provide multi-speed direct drive motors.
- C. Provide filter rack with access panel.
- D. Controls shall include: programmable 24-volt thermostat, control transformer, fan motor relay, and time delay relay.
- E. Coils shall be copper tube with aluminum fins.
- F. All polyphase motors shall be of the premium efficiency type, with nominal efficiency equal to or greater than that stated in NEMA MG 1, Table 12-12 for that type and rating of motor.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF AIR HANDLING UNITS

- A. Install air handling units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes. Coordinate with other work, including ductwork, floor construction, roof decking, and piping, as necessary to interface installation of air handling units with other work. Provide access space around air handling units for service as indicated, but in no case less than that recommended by manufacturer.
- B. Install floor mounted air handlers on minimum 4" high reinforced concrete pad, 4" larger on each side than unit base. Mount air handler on spring isolators in accordance with manufacturer's instructions.

3.3 STARTUP AND CLOSEOUT PROCEDURES

- A. Upon completion of installation of air handling units, start-up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

- B. Provide two complete extra sets of filters for each air handling unit. Install new filters at completion of air handling system work, and prior to testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed.
- C. Provide one set of extra belts for each belt-driven air handling unit. Obtain receipt from Owner that belts have been received.

END OF SECTION

SECTION 23 73 15 - VARIABLE FREQUENCY DRIVES

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 handler/pump variable frequency drives, also referred to as Adjustable Frequency Drives (AFD), Variable Speed Drives (VSD), and Adjustable Speed Drives (ASD) work required by this Section is indicated on drawings and schedules, and by requirements of this Section.
- B. Refer to Division 26 sections for power supply wiring from power sources to power connection on adjustable frequency drives; not work of this Section.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of variable frequency drives for the HVAC industry with characteristics, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than five years.
- B. UL Compliance: Provide variable frequency drivers and components which are listed and labeled by Underwriter Laboratories. Additional standards include IEEE 519, NEC 508, and NEMA.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's drive specifications, including harmonic current generation, installation, and start-up instructions.
 - 1. Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, wiring diagrams and methods of assembly of components.
 - 2. Submit a Harmonic Distortion Analysis for this job site location based on the actual electrical service equipment and HVAC equipment being installed.
- B. Maintenance Data: Submit maintenance data including a preventative maintenance schedule and parts lists.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Handle adjustable frequency drives and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged drives or components; replace with new.

- B. Store drives and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's installation instructions for unloading drives and moving them to final location.

1.6 WARRANTY

- A. All units shall be warranted by the manufacturer for a period of 36 months from date of shipment.
- B. The warranty shall include on-site, factory-authorized, repair or replacement of parts, travel time, and travel expenses for warranty repairs.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Trane TR1 Series, Danfoss Graham, and ABB. Other VFD manufacturers wanting to bid, must provide a submittal and gain approval 10 days prior to bid. All approved manufacturers must still meet the following specifications.

2.2 GENERAL

- A. Furnish complete variable frequency VFD's 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 1 enclosure, or other NEMA type according to the installation and operating conditions at the job site. The VFD's UL listing shall allow mounting in plenum or other air handling compartments. If a NEMA 12 enclosure is required for the plenum rating, the manufacturer must supply a NEMA 12 rated VFD.
- 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 eliminate the need for motor derating.
- C. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFD's utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
- D. The VFD shall include an input full-wave 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 and be

UL-508 certified for the building and assembly of option panels. Assembly of the option panels by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel. Both VFD and option panel shall be manufactured in ISO 9001 certified facilities.

- F. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics.
- G. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.
- H. The VFD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.
- I. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.
- J. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.
- 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 de-couple the motor from the load to run the test.
- L. Galvanic and/or optical isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFD's not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.
- M. VFD shall minimize the audible motor noise through the used of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.
- N. PROTECTIVE FEATURES
 - 1. A minimum of Class 20 I2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.
 - 2. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD over temperature, and motor over temperature. 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 164 V AC for 208/230 volt units, 313 V AC for 460 volt units, and 394 volts for 600 volts units.
4. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
5. VFD package shall include semi-conductor rated input fuses to protect power components.
6. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the VFD manufacturer must ensure that inverter rated motors are supplied.
7. VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
8. VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
9. VFD 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. VFD 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. VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt units, 539 V AC on 460 volt units, and 690 volts on 600 volt units.

O. INTERFACE FEATURES

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference.
2. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.
3. The VFD shall provide 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. The keypads for all sizes of VFD's shall be identical and interchangeable.
6. To set up multiple VFD's, it shall be possible to upload all setup parameters to the VFD's keypad, place that keypad on all other VFD's in turn and download the setup parameters to each VFD. To facilitate setting up VFD's of various sizes, it shall be possible to download from the keypad only size independent parameters.
7. Display shall be programmable to display in 9 languages including English, Spanish and French.
8. The display shall have four lines, with 20 characters on three lines and eight large characters on one line.
9. 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 VFD when the keypad is removed.
10. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.
11. As a minimum, the following points shall be controlled and/or accessible:
 - a) VFD Start/Stop
 - b) Speed reference
 - c) Fault diagnostics
 - d) Meter points
 - (1) Motor power in HP
 - (2) Motor power in kW
 - (3) Motor kW-hr
 - (4) Motor current
 - (5) Motor voltage
 - (6) Hours run
 - (7) Feedback signal #1
 - (8) Feedback signal #2
 - (9) DC link voltage
 - (10) Thermal load on motor
 - (11) Thermal load on VFD
 - (12) Heatsink temperature
12. Four additional Form C 230 volt programmable relays shall be available for factory or field installation within the VFD.
13. LONWorks communication shall be available for factory or field installation within the VFD.
14. Two set-point control interface (PID control) shall be standard in the unit. VFD shall be able to look at two feedback signals, compare with two set points and make various process control decisions.
15. Floating point control interface shall be provided to increase/decrease speed

in response to contact closures.

16. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VFD's unable to show these four displays simultaneously shall provide panel meters.
17. Sleep mode shall be provided to automatically stop the VFD when its speed drops below set "sleep" level for a specified time. The VFD shall automatically restart when the speed command exceeds the set "wake" level.
18. The sleep mode shall be functional in both follower mode and PID mode.
19. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
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, kW/hr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VFD 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. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (oF) for a cooling tower application.
22. VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
23. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFD's heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.
24. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
25. The VFD shall store in memory the last 10 faults and related operational data.
26. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

27. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.
28. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.
29. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.
30. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

P. ADJUSTMENTS

1. VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.
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 shall be automatically contoured to ensure no-trip acceleration and deceleration.
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 and inverter overload.
6. The number of restart attempts shall be selectable from 0 through 20 or infinitely 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.

Q. BYPASS

1. Provide a manual 2-contactor bypass consisting of a door interlocked main fused disconnect pad lockable in the off position, a built-in motor starter and a three-position DRIVE/OFF/BYPASS switch controlling two contactors. In the DRIVE position, the motor is operated at an adjustable speed from the VFD. In the OFF position, the motor and VFD are disconnected. In the BYPASS position, the motor is operated at full speed from the AC power line and power is disconnected from the VFD so that service can be performed. In case of an external safety fault, a customer supplied normally closed dry contact shall be able to stop the motor whether in DRIVE or BYPASS mode.

2. Service personnel shall be able to defeat the main power disconnect and open the bypass enclosure without disconnecting power. This shall be accomplished through the use of a specially designed tool and mechanism while meeting all local and national code requirements for safety.

R. SERVICE CONDITIONS

1. Ambient temperature, -10 to 40°C (14 to 104°F).
2. 0 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 units. All power and control wiring shall be done from the bottom.

S. 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 speed and shall be cycled during the test.
2. All optional features shall be functionally tested at the factory for proper operation.

T. SUBMITTALS

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. Harmonic filtering. The seller shall, with the aid of the buyer's electrical power single line diagram, providing the data required by IEEE-519, perform an analysis to initially demonstrate the supplied equipment will meet the IEEE standards after installation. If, as a result of the analysis, it is determined that additional filter equipment is required to meet the IEEE recommendations, then the cost of such equipment shall be included in the bid. A harmonic analysis shall be submitted with the approval drawings to verify compliance with the latest version of IEEE-519 voltage and current distortion limits as shown in table 10.2 and 10.3 at the point of common coupling (PCC). The PCC shall be defined as the consumer-utility interface or primary side of the main distribution transformer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which variable frequency drives are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF DRIVES

- A. General: Install unit mounted variable frequency drives where indicated, in accordance with manufacturer's published installation instructions, complying with recognized industry practices to ensure that system complies with requirements and services intended purposes.
- B. Access: Provide access space around drives for service as indicated, but in no case less than recommended by manufacturer.
- C. Input power and motor leads for each VFD shall be in a separate dedicated steel conduit. Control wires shall be shielded in dedicated steel conduit. Shielded cable used for analog signals shall have its shield grounded at the VFD only. Shielded cable used for digital signals shall have its shield grounded at both ends.

3.3 START-UP, CLEANING AND TRAINING

- A. The manufacturer shall provide start-up assistance in the form of a factory trained service technician.
- B. VFDs shall not be powered up without authorization from the VFD manufacturer. The contractor shall notify the VFD manufacturer when the units have been installed and shall schedule a minimum of one day of startup, by a factory trained and authorized technician, for every group of 5 VFD units. This technician shall complete a startup report that records all VFD data, settings, and a check list of tests and observations. The VFD manufacturer shall retain this report.
- C. Provide one 4 hour training session on site by a VFD factory trained and authorized technician. This session shall review all operation and maintenance requirements plus the fundamentals of VFD's and their application to AC motors.
- D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 25 90 00 - FACILITY MANAGEMENT AND CONTROL SYSTEM (FMCS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Facility Management and Control System (FMCS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only. The FMCS shall be capable of total integration of the facility infrastructure systems with user access to all system data either locally over a secure Intranet within the building or by remote access by a standard Web Browser over the Internet. The FMCS system shall include HVAC control, energy management, alarm monitoring, and all trending and reporting functions related to normal building operations all as indicated on the drawings or elsewhere in this specification.
- B. Optional monitored and controlled services shall be as shown on the drawings and may include, but are not limited to electrical, gas, and water metering, lighting control, security and personnel access control, fire & life safety systems, domestic water, grey water, and sewage pumping systems, and maintenance management functions related to normal building operations.
- C. All labor, material, equipment and software not specifically referred to herein or on the plans, but are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.
- D. All bidders shall include the base bid price with KMC Listed.

1.2 QUALIFICATION OF BIDDERS

- A. All bidders must be Systems Integrators and specialty control contractors in the business of installing direct digital temperature controls.
- B. All equipment manufacturers desiring to provide a "package price" of HVAC equipment inclusive of the complete automatic temperature controls system are specifically required to provide separate prices for the equipment less controls. The equipment vendor shall provide a separate proposal for the FMCS system inclusive of all HVAC equipment controllers, sensors, actuators, control valves, operator workstations and other devices necessary for a complete and functional FMCS system as stated by the requirements of this section. Any equipment supplier that will NOT break out the controls portion of his "package" bid price will be excluded from providing BOTH controls AND equipment.
- C. All bidders shall be factory owned branch office or factory authorized, independent installing contractor or Certified Systems Integrator of the manufacturers specified.
- D. All bidders shall have a local engineering and service office within 150 miles of the job site and/or be able to remotely access a system via the internet within one working day to diagnose system problems or issues via the internet.

E. All manufacturers not named in sub-paragraph E.7 below desiring to bid this project shall obtain the Engineer's pre-approval not less than 1 weeks prior to bid day by a pre-submission of:

1. The BACnet Testing Laboratory (BTL) certification listing (available at www.bacnetinternational.org website) that indicates compliance of the model and version of firmware to be provided for each DDC controller to be used.
2. A copy of the testing submission letter for the product from the manufacturer to BTL for those products in testing at BTL and awaiting approval.
3. The manufacturer shall submit a list of exact models to be provided similar to sub-paragraph F.6 below for review and acceptance by the Consulting Engineer. Each of these models shall be listed on the BTL certification website or the manufacturer shall submit a copy of the BTL test submission letter as described in sub-paragraph 2 above.

F. Acceptable products:

1. All bidders shall submit a Base Bid Price utilizing KMC Controls. Pricing may be obtained from the local KMC Authorized Installing Contractor by contacting:
 - a. Automated Building Control Systems, Inc. 813-879-8222
 - b. paolo_s@abc-controls.com
2. All HVAC Instrumentation and Controls and FMCS control products provided shall be of the same manufacturer including DDC controllers, Operator Workstation software for a complete and functional system.
3. All products shall be manufactured in the USA and manufacturer shall submit certified documentation showing point of manufacture as the USA.
4. The complete FMCS and DDC control system provided shall comply with ANSI/ASHRAE/ISO standard 135 "BACnet" standard.
5. Specialty 3rd party software and hardware gateway interfaces for optional FMCS services that are to be integrated into the FMCS system shall comply with the BACnet 135 standard. The BACnet interface shall conform to one of the following BACnet 135 standard sub-sets; BACnet IP, BACnet MS/TP, or BACnet Ethernet. These interfaces shall be provided by the 3rd party vendor for the building service provided along with all software configuration and programming tools necessary for the FMCS contractor to integrate such items into a complete and functional system. These items include but are not limited to:
 - a. Power metering and electrical switchgear interfaces
 - b. Standby Generators control sets and interfaces
 - c. Fire Alarm Systems
 - d. Security and Access Control Systems
 - e. CCTV systems
 - f. Lighting Control Systems
 - g. Variable Frequency Drive Systems

6. Subject to compliance with the above, the following manufacturers DDC systems components are acceptable as approved under the BTL standard for the BTL product categories listed.
 - a. Advanced Operator Workstation complying with BACnet Standard Category B-AWS.
 - 1) KMC Controls Total Control Software - Consists of software Suite comprised of models TC-BAC, TC-BACUNL, and options as required TC-GATE and TC-OPC, Version 3.4 or later.
 - b. Operator Engineering Toolset - Requires all vendor software required to allow an owner/operator to fully configure, program, and maintain application sequences of operation, graphical user interfaces, and web pages in applied digital controllers and the user workstations provided as a part of this project.
 - 1) KMC Controls - TC-STUDIO Software
 - c. Routers - BAC-5050 - Up to 80 devices per sub-lan MS/TP trunk with KMD-5575 repeater/isolator for every 31 devices per sub-lan.
 - d. Building Controllers (B-BC) - Provide B-BC Category, BTL Listed BACnet Building Controller for each of the units or equipment groups indicated on the project drawings, subject to the following minimum usage requirements:
 - 1) Minimum usage requirements per equipment group as defined.
 - a) Air Handling Units \geq 20 Tons Capacity requiring 1 per AHU
 - b) Supply & Exhaust Fans - No more than 40 exhaust fans may be grouped in one controller.
 - c) Chillers, Boilers, Pumps, Cooling Towers - Provide minimum of (1) Building Controller for each chilled water plant not exceeding (5) chillers, (5) cooling towers, (5) primary chilled water pumps, (5) condenser water pumps, (1) chilled water header, (1) condenser water header, and (20) secondary chilled water pumps.
 - d) Sub-network controller - Provide for BACnet routing of not less than (2) sub-networks with minimum capacity of up to (80) sub-net devices per trunk.
 - 2) KMC Controls - Models BAC-A1616BC-000 OR -001, Firmware Version E1.2.0.8 or later
 - a) Advanced Application Controllers - Provide B-AAC Category BACnet Advanced Application Controllers that are fully programmable for each of the units or equipment groups indicated on the project drawings, subject to the following minimum usage requirements:
 - (1) Minimum usage requirements per equipment group as defined.
 - i) Terminal unit controllers - (VAV, FCU, applications only) - 1 per unit with exception of dual duct or zone

tracking application that may require two per zone.

- ii) Small Packaged Unitary Equipment < = 20 Tons capacity - 1 per unit
- iii) Air Handling Units > = 20 Tons Capacity - 1 Per unit
- iv) Supply & Exhaust Fans - 1 per group of no No more than 4 exhaust fans.
- v) Chillers, Boilers, Pumps, Cooling Towers - BAC-5901 per set of chiller, cooling tower, supply water pump, condenser water pump.

(2) KMC Controls - Models BAC - 7000 Series, BAC-58XX Series, BAC - 1XXX Series

- 7. Subject to compliance with performance requirements of the application, the following actuators, sensors, and control valves are acceptable for use on this project.

- a. KMC Controls

G. UNACCEPTABLE PRODUCTS & MANUFACTURER

- 1. LONMARK Products - NO LON DEVICES OR GATEWAY DEVICES SHALL BE ACCEPTABLE.
- 2. PROPRIETARY Products - NO PROPRIETARY COMMUNICATION PRODUCTS SHALL BE ACCEPTABLE.
- 3. HVAC EQUIPMENT MANUFACTURER FACTORY MOUNTED CONTROLS - HVAC Equipment manufacturers that desire to provide equipment with factory mounted controls shall only provide controls that are BTL Listed device. All other controllers or controls that are provided with an optional "BACnet gateway" shall not be acceptable. The equipment manufacturer shall include in their price all configuration and integration software and technical support costs to provide such software tools and support to the FMCS contractor as necessary for the integration of the HVAC equipment into the FMCS system.
- 4. Due to the complexity and requirements of this project, all BTL category "Application Specific Controllers" (B-ASC) ARE NOT APPROVED AND MAY NOT BE USED IN THIS PROJECT.
- 5. Only vendors named in this specification or pre-approved by addendum shall be acceptable.

1.3 SYSTEM DESCRIPTION

- A. The entire Facility Management and Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating on an open protocol communication network to a host computer within the facility and communicating via the internet to a host computer in a remote location. All devices

shall utilize the ASHRAE/ANSI standard 135 "BACnet" Protocol in either the "BACnet IP" or "BACnet MS/TP" configurations.

- B. The basic controls system also includes all sensors, controllers, instruments, valves, actuators, devices specified in Section 23900 (Instrumentation and Controls) or this section, installation and service for a complete and functional controls system. All control devices (valves, dampers, actuators, etc.) are included under the FMCS contract unless specifically specified elsewhere in this document or in the HVAC Specification. Control system shall be designed to allow easy field adjustment of all set points and parameters.
- C. All 3rd party devices such as chillers, air handlers, power metering devices, security & access control devices, fire/life-safety systems and lighting systems that are desired to be integrated into the FMCS system shall be provided with "Native BACnet" interfaces or controllers that strictly comply with the BACnet standard and shall be BTL Listed on the BACnet International website www.bacnetinternational.org. No unlisted gateways or other proprietary gateways shall be allowed to be used by any equipment manufacturer or 3rd party for integration into the FMCS specified herein.

1.4 INTENT OF DRAWINGS and SPECIFICATIONS

- A. This specification defines the minimum equipment and performance requirements for an interoperable Building Automation System (BAS).
- B. The implied and stated intent of the drawings and specifications is to establish minimum acceptable quality standards for device-level integration of material and equipment as well as workmanship and to provide a complete and operable BAS. All vendors listed shall provide the model numbers listed for the class of BTL device shown that meets the specified application requirements. Any other vendor requesting approval for this project not listed shall be pre-approved according to the procedure outlined in paragraph 1.2.D and shall be named by Addendum. The Addendum shall also specify the approved list of the additional named vendors product model numbers for each BTL classification. Component products (actuators, valves, sensors, etc.) shall be of one of the named vendors in paragraph 1.2.E.7 or as named in Section 23900. **NO OTHER VENDORS SHALL BE APPROVED.**
- C. The drawings are diagrammatic intending to show a workable general arrangement and location of components and are not necessarily complete or rigid in all details.

1.5 SCOPE

- A. Provide all labor, materials, programming and supervision necessary to install a Direct Digital control system (DDC).
- B. The scope of work shall include but not be limited to the following:
 - 1. Provide and install FMCS software and workstations compliant with the specifications herein consisting of:
 - a. An FMCS server computer with processor, memory and other

- requirements as specified by the listed manufacturers above.
 - b. (1) operator workstations (OWS) consisting of client workstations computers with processor, memory and other requirements as specified by the listed manufacturers above.
 - c. All Manufacturer (OWS) software and Engineering Toolkit software meeting the requirements of the listed and approved manufacturer above.
 - 2. Control of (1) Chiller Plants systems with a total of (2) chillers. Each chiller plant consists of:
 - a. 2-Chillers
 - b. 2- Chilled Water Pumps
 - c. Associated isolation valves for the chiller primary loop
 - d. Temperature sensors, control valves, and control points as shown on the drawings or indicated on the points list.
- C. The Control Contractor shall furnish all electrical control and interlock wiring connected to the controls and instrumentation systems. 110 VAC or greater voltage power wiring to main control panels (i.e. AHU's) as shown on the mechanical plans and/or specifications, shall be provided by Division 16 Contractor (Electrical), and coordinated by this Contractor. Failure of this Contractor to coordinate requirements with other Divisions shall result in this Contractor to be responsible for any non-coordinated items. Control power to operate VAV boxes shall be the responsibility of this Contractor.
- D. All conduits in connection with the controls and instrumentation system shall be furnished and installed by this Contractor.
- E. The Control Contractor shall complete all sensing and control installations including electrical and electronic components, not the Mechanical Contractor, unless otherwise required.
- F. Provide a comprehensive operator and technician-training program as described herein.
- G. Provide as-built documentation, software, and all DDC control logic and all associated support documentation on approved media, which accurately represents the final installed system.

1.6 COORDINATION

- A. The Control Contractor shall supply the control valves, immersion wells and couplings for flow and pressure switches to the Mechanical Contractor for installation.
- B. The Mechanical Contractor shall install all automatic control damper. The Controls Contractor shall supply all actuators for control dampers not furnished as part of the equipment by the Mechanical equipment supplier. The Mechanical Contractor is responsible for providing and installing blank off plates if needed when the control application requires dampers smaller than duct size.

- C. The direct digital portions and automatic temperature control system shall be provided and installed by the Control Contractor.
- D. Coordination of all controls items with other trades shall be the responsibility of the Controls Contractor. Coordination of wall space for panels shall be the responsibility of the Controls Contractor.
- E. The Control Contractor shall be fully responsible for coordination of all sensor locations with furniture cabinets.
- F. FMCS contractor shall provide all routers specific to the FMCS system and CAT 5 cable connections not to exceed 25' in length to nearest port supplied by the Electrical Contractor.

1.7 SUBMITTAL

- A. Four copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation as well as a hard copy graphical depiction of the application control programs shall also be included with the submittal package.
- B. Submittal shall also include a trunk cable schematic diagram depicting the Graphical User Interface (GUI) computer, control panel locations and a description of the communication type, media and protocol.
- C. Submittal shall also include a complete point list of all connected points to the DDC system.
- D. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on magnetic floppy disk media or compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Four copies of the 'as-built' drawings shall be provided in addition to the documents on magnetic floppy disk media or compact disk.

1.8 AGENCY AND CODE APPROVALS

- A. All products of the FMCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 - 1. UL-916; Energy Management Systems
 - 2. UL-864, Category UUKL; "Smoke Control Systems" for all Fan and Damper systems controlled in a smoke control sequence as specified in Section 25950 "Sequences of Operation".

3. ULC; UL - Canadian Standards Association
4. FCC, Part 15, Subpart J, Class A Computing Devices
5. All DDC Controllers shall be BACnet Testing Laboratories Listed or the manufacturer shall provide a letter indicating the date at which the proposed equipment was submitted to BTL for certification.

1.9 SOFTWARE LICENSE AGREEMENT

- A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.11 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.12 QUALITY ASSURANCE

- A. The Manufacturer of the FMCS digital controllers shall provide documentation supporting compliance with ISO-9001 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). Product literature provided by the FMCS digital controller manufacturer shall contain the ISO-9001 Certification Mark from the applicable registrar.

1.13 SPECIFICATION NOMENCLATURE

- A. Acronyms used in this specification are as follows:
 - B-BC BACnet Listed Building Controller
 - B-AAC BACnet Listed Advanced Application Controller
 - B-ASC BACnet Listed Application Specific Controller
 - B-OWS BACnet Listed Operator Workstation
 - DDC Direct Digital Controls
 - FMCS Facility Management and Control System
 - GUI Graphical User Interface
 - LAN Local Area Network

LON/LONWorks Products manufactured using the "Echelon" LON chipset(s)
 OOT Object Oriented Technology
 PICS Product Interoperability Compliance Statement
 PMI Power Measurement Interface
 POT Portable Operator's Terminal
 VAV Variable Air Volume Controller
 WAN Wide Area Network
 WBI Web Browser Interface

PART 2 MATERIALS

2.1 GENERAL

- A. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, portable operator terminals, printers, network devices and other devices as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.
- C. Design, select, furnish, and install an FMCS system and components that meets the following minimum performance criteria:
 - 1. Input to output response of a control loop within a controller - Less than 100 milli-seconds.
 - 2. Operator command to output change of state - 10 seconds.
 - 3. Input or Output change of state to operator workstation view of a directly connected OWS - 10 seconds.
 - 4. Output change of state to remote operator workstation view via an Internet browser OWS- 15 seconds.
 - 5. Cross panel data sharing of 10 data values - 10 seconds.
 - 6. Control setpoint deviation - DDC controllers shall maintain the controlled variable within the following performance criteria:
 - a. Room temperature - +/- 0.5F, (0.3C)
 - b. Duct Temperature - +/- 1F, (0.5C)
 - c. Duct Static Pressure - +/- 0.2"WC
 - d. Liquid Pressure - +/- 5% of operating range

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide an ANSI/ASHRAE/ISO Standard 135-2008 BACnet compliant, peer-to-peer networked, stand-alone, distributed control system. The FMCS system shall be comprised of a network of the following categories of BACnet Testing Laboratories (BTL) Listed controllers:

1. B-AWS - BACnet Advanced Operator Workstations
 2. B-BC - BACnet Building Controllers
 3. B-AAC - BACnet Advanced Application Controllers
 4. B-RTR - BACnet routers for BACnet MS/TP, BACnet IP, and/or BACnet/Ethernet protocols
- B. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host or other communications controller to pass data shall not be acceptable.
- C. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

2.3 BACnet Advanced Operator Workstation (B-AWS)

- A. The operator workstation shall be from one of the named suppliers and conform to the BACnet 135-2008 standard (B-AWS) profile.
- B. The workstation shall contain the following standard operational communication and database features:
1. The supplied computer software shall be a standard "suite" of programs from a pre-approved vendor. Non pre-approved vendor systems are not acceptable. All pre-approved programs are defined in section 1.2.E.6.
 2. The operator workstation software shall employ a recognized operating system and development framework and shall include:
 - a. Operating System - Windows 7, or Windows 2008 Server
 - b. Development System Framework - Microsoft .Net V3.0 or later
 - c. BMS Database:
 - 1) SQL Server Express 2005 or later- Systems < 300 DDC controllers
 - 2) SQL Server Workgroup - Systems 301 - 750 DDC controllers
 - 3) SQL Standard Systems - 751 - 1500 DDC controllers
 - 4) SQL Enterprise Systems - >= 1501 DDC controllers
 3. BACnet Compliance - The operator workstation shall provide BACnet driver services embedded as the basis of network communications. The driver service shall support:
 - a. BACnet IP
 - b. BACnet Ethernet (8802.3)
 - c. Foreign Device Registrations
 - d. Bacnet Broadcast Management Device (BBMD) Services
 4. 3rd Party Communication Software compliance - The operator workstation shall support the additional 3rd party "proprietary" and optional "open communication" software protocols for integration of 3rd party "non-BACnet" devices

- a. "KM-Digital" from KMC Controls
 - b. OPC as an OPC data acquisition client
 - c. Object values from one of the proprietary communication protocols shall be allowed to be directly presented on the operator workstation screen.
 - d. The operator workstation shall optionally include a "gateway" driver that enables a trained engineer to configure a table of values that maps object values from one of the proprietary protocols to the BACnet protocol and vice versa. The protocol gateway shall allow the mapped values to be exchanged between protocols at custom programmable frequencies ranging from 5 seconds minimum to 30 days maximum.
- 5. Embedded Web Server and Internet Browser - The Building Management System shall be allowed to be operated from any computer with a standard web browser. At a minimum, browsers supported shall include Internet Explorer.
- C. The B-AWS shall contain the following minimum features and applications that are used by a trained operator to operate the BMS system.
 - 1. Software Components - The B-AWS software shall support the following standard system modules and components
 - a. Trend Service
 - b. Notification Service
 - c. Protocol Driver Service
 - d. Protocol Gateway Service
 - e. System (B-AWS) System Monitor Engine
 - f. SQL Server 2005 Database
 - g. Web Monitor & Control Services
 - 2. User Access & Control
 - a. There shall be the capability for > 500 individual user names to be defined. Each user will have a defined set of "permissions" that enable or disable access to various software features and capabilities.
 - b. There shall be a minimum of (1) concurrent web seat provided with the B-AWS software and optional licensing capability to an unlimited number of concurrent web seats. The optional licensing may be restricted by the number of concurrent users provided by the Microsoft operating system utilized to some number less than unlimited.
 - c. Each user shall have a unique, programmable "user name" and "password" that is used to sign on to the B-AWS software via an internet browser. For each name, it shall be possible to identify a specific "home page" that the user is logged into. From the user home page, navigation permissions will be used to restrict an individual user to certain subordinate web pages that are linked to the home page, allow or disallow various user actions, etc.
 - d. There shall be at least (15) operator service permissions that can be

granted to each operator.

- e. A user with the highest level of password access shall be designated as a "web administrator" and shall have the capability of changing permissions for subordinate users via the web.

3. Graphical User Interface (GUI)

- a. The fundamental operator portal shall present a "graphical", intuitive user interface to a user that displays any combination of graphical system schematics, building floor plan representations, pictorial images, or other "user intuitive" background images with live, real-time data super imposed on the background.
- b. The real-time data values can be an data object value, setpoint, schedule value, or other real-time piece of information from the BMS system that enables the user to operate the system using the "dashboards" created for them by the BMS specialist.
- c. Each image shall be a published web page that is accessible only when an authorized user is signed on to the system.
- d. It shall be possible for multiple users to view the same web page simultaneously.
- e. Data values may be represented as text, animated gauges and instruments, slider bars, animated .gif files, LED type displays, or other common, intuitive data representations that make the real time status of the system easy to understand for the user.
- f. Certain defined fields may change state, color, or size depending on the normal or off-normal status of the associated data point.
- g. There shall be "hot link" buttons that enable frame to frame navigation by the user from one web page to another. Simultaneously, there shall be a drop down menu of subordinate pages to provide another rapid penetration scheme for a user. Only those pages accessible to the user via the assigned permissions shall be viewable to segregate a large system into segments that may be defined by building, area, etc. in a multi-user or multi-tenant facility.
- h. There shall be "hot link" buttons to stored documents such as written sequences of operation, maintenance manual pages, or other common files that a user may need access to enable easy operation of connected equipment, the identification of spare parts, etc.
- i. Any data value displayed shall be updated by the system within a programmed period of time, typically set from 5 - 30 seconds.
- j. An operator action such as changing a setpoint shall be executed by the system typically within 5 - 10 seconds.
- k. Refresh of a given graphical display shall be automatic and shall typically occur within every 5 - 10 seconds.

4. Historical Trend Data Reporting Operations

- a. The B-AWS shall automatically import trend object data from DDC controllers and store the data automatically in the SQL database. Trends that are updated on a periodic basis shall be appended to the trend file in the database.
 - 1) Trends shall be automatically imported from trend objects located in DDC controllers requesting that their data be

- periodically sent to the B-AWS. These updates shall take place at frequencies programmed into the database trend objects and NOT require any polling of the B-AWS operating software. Such trends shall automatically buffer their data so that a "busy" network does not cause loss of data.
- 2) Trends may be optionally configured by the B-AWS Engineering toolkit software to be "polled" by the B-AWS of specific BACnet or 3rd party software points. Such objects shall have individually defined polling frequencies and shall automatically update and append to the accumulated trend data file.
- b. A trend viewer shall be provided that allows the operator:
 - 1) To select a minimum of up to 8 data values simultaneously on the same graphical web page.
 - 2) For each value, individual "y" axis range values shall be automatically ranged or manually set according to user preference. The "x" axis shall provide periodic time stamps that are indicative of the frequency for the trend data to be displayed.
 - 3) Resolution shall be to the second if necessary.
 - 4) Standard multi-variable displays shall be in color, with a separate color being used for each variable for easy comparative trend views.
 - 5) Each "group" of variables may be displayed at one time, or, each individual variable may be graphed separately according to operator preference.
 - 6) The operator shall be able to select a date or time range of the stored trend values for historical analysis.
 - 7) Trend displays shall be independent of other real-time operations and shall not interfere with the normal data gathering, alarm processing, or other real-time functions of the B-AWS workstation.
 - c. Trended values shall be easily exported via a mouse click to common file formats including "Excel" or ".csv" file formats for use as imported data by 3rd party report writing and generating software.
5. Alarm Management Operations
- a. An alarm management module shall be provided that allows a user to display, acknowledge, export, and otherwise manage alarm messages that are processed to the module by the system.
 - b. The alarm module shall automatically distinguish various priorities of alarms and allow alarms to be sorted according to user preference. Various categories of alarms may include, but not be limited to:
 - 1) BMS system or Panel Alarms - Alarms indicating that a panel is "on" or "off" line, communication failures, etc.
 - 2) Control discrepancy alarms - Various levels of control data point alarms including:
 - a) Command does not match actual control value within a definable alarm delay period.
 - b) Analog values are outside of operating limits such as a setpoint deviation alarm, high limit alarm, or low

- limit alarm.
 - 3) Maintenance Required Alarm - Various maintenance type alarms including but not limited to:
 - a) Run time limit exceeded.
 - b) # of cycles of operation exceeded
 - c) Controlled equipment alarm input tripped
 - d) Electrical trip alarm
 - c. The alarm module shall allow the operator to run reports of stored alarm data including, but not limited to:
 - 1) Current points in alarm, but not acknowledged
 - 2) All alarm points
 - 3) Off-line points and/or DDC control panels
 - d. Alarm generation shall be done in the DDC panels and sent to one or more B-AWS workstations according to the BACnet standards. This shall allow various scenarios including but not limited to:
 - 1) Scheduling of alarms to various B-AWS workstation locations
 - 2) Sending of alarm notifications to one or more notification classes dependent upon the type and severity of the alarm.
 - 3) Generation of a custom alarm message for each alarm.
 - 4) Emailing of the alarm to various off-site locations based on time-of-day or calendar functions.
- 6. Scheduling Operations
 - a. The B-AWS software shall enable a qualified operator to:
 - 1) Make permanent or temporary changes to programmed schedule operations.
 - 2) Make one change on a schedule page that affects all relevant equipment such as all AHUS, lighting circuits and VAV terminal units,
 - 3) Make temporary holiday or calendar overrides of pre-scheduled equipment.
 - 4) Obtain positive verification that all scheduling change actions are executed at all affected pieces of equipment.
- 7. Operator Action Audit Log
 - a. The B-AWS software shall automatically log all operator actions to a historical journal log in the SQL database.
 - b. The action log shall be retrievable by date range, operator identification, or other common sorting criteria.
- 8. B-AWS Standard Reports - The B-AWS software shall provide the standard following reports
 - a. All Points summary - A report of a "snapshot" of all currently configured data objects and their current values. This report may be executed on demand or at an operator scheduled frequency.
 - b. Overrides Report - A report of all "overridden" objects currently operating in "manual" mode.
 - c. Run time Report - A report of all "run-time" designated objects that captures accumulated equipment run time, last start time, and last stop time.
 - d. Out-of-Service Report - A report that lists all non-functioning objects

and points.

2.4 BACnet Engineering Workstation Software

- A. The City of Tampa's existing KMC Total Control Design Studio shall be utilized for building and maintaining graphics and databases for the new BAS.
- B. The workstation shall contain the following standard operational communication and database features:
 - 1. The supplied computer software shall be a standard "suite" of programs from a pre-approved vendor. Non pre-approved vendor systems are not acceptable. All pre-approved programs are defined in section 1.2.E.6.
 - 2. The operator workstation software shall employ a recognized operating system and development framework and shall include:
 - a. Operating System - Windows 7 or Windows 2008 Server
 - b. Development System Framework - Microsoft .Net V3.0 or later
- C. The software shall function as a complete operator workstation as identified in paragraph 2.3 above.
- D. In addition, the workstation shall provide all of the additional features contained within this section to create, modify, program, configure, operate, and troubleshoot the BMS system provided from an on site or remote access location.
 - 1. Network Manager - Provide a Network Management function that displays, all operating BMS communication services including networks of controllers, network communication services, objects, and other functions.
 - a. All networks and services shall identify a unique network number, object mnemonic, and provide real-time color displays of whether the device, network, or service is properly functioning or not communicating.
 - b. Networks can be identified by site, number, sub-network or any portion thereof according to the physical and virtual installation information provided by the manufacturer.
 - c. All allowed communication protocols (BACnet, OPC, or proprietary) that are supported by the workstation shall be clearly identified.
 - d. The network tree shall automatically expand or contract depending on the user's desired view using Microsoft standard features.
 - e. The network manager shall automatically detect and display objects from all supported protocols, independent of the manufacturer's device. "Foreign devices" from 3rd party vendors such as other HVAC controls manufacturers, Variable Frequency Drive Manufacturers, Electrical Switchgear, HVAC equipment manufacturers, Access and Security system manufacturers, and Fire Alarm manufacturers that have enabled "BACnet" or "OPC" object categories shall be detected and automatically integrated into the network tree structure.
 - 2. Graphics page designer - Provide a graphical web page design tool that

- enables a trained engineer/user to create, modify, and publish existing or new web pages to suit the needs of the project(s).
- a. Provide a library of standard mechanical, electrical, gauges, displays, and other items, grouped into sub-libraries of related equipment. The library shall have a minimum of 100 standard elements that may be used to create mechanical system schematics, diagrams etc. Standard elements shall included but not be limited to:
 - 1) Fans
 - 2) Pumps
 - 3) Piping
 - 4) Ductwork
 - 5) Mechanical equipment renderings including chillers, boilers, AHUs, VAV terminals, Fan Coil Units, Rooftop Units, pumps,
 - 6) A library of dynamic elements that provide realistic motion or animations of actual performance while operating.
 - 7) Control elements including temperature sensors, pressure sensors, humidity sensors, damper sections, control valves, differential pressure switches, current switches, etc.
 - b. Provide the ability to import standard file formats such as AutoCad or Visio files for floorplans, pictures or other items, .pdf files, .gif., .bmp or other image files for use in background or as appended files that provide additional information such as maintenance procedures at the click of a mouse.
 - c. Provide dynamic control elements such as gauges, indicators, dynamic text fields, etc. and locate them on the web pages for easy use and operation by a trained user.\
 - d. Provide page links that allow users to navigate from one page to another with a single mouse click if desired in a hierarchical methodology. Linking shall be nested or direct if desired during the set up of each page.
 - e. Provide the ability to store "once created/used" files as a template for additional systems of the same type. The template shall maintain all features of the original including the binding of all dynamic points, background fields, color properties etc. for use in replication of the page to duplicate pages.
 - f. Provide a web page replication feature that replicates a template to any number of duplicates. The only item that needs to be changed on the replicated page are the address of the dynamic points to be used. Such replication shall be possible by a "search and replace" function to minimize time.
 - g. Provide a web page publishing function that allows publication of pages to the target site computer server or directly into target controllers via the internet that support embedded web servers.
 - h. Provide a "drag & drop" dynamic value point binding mechanism that allows a trained engineer to locate an object value, drag it on to the web page at a location represented by a dynamic element, and permanently locate the value with the click of a mouse.
 - i. Provide group, ungroup, and other standard custom create, edit, modify features for the page editor.

3. DDC Controller Programming & Configuration
 - a. Provide a set of utilities that enable the trained engineer to properly configure inputs, outputs, control loops, logic, and all other properties of supported BACnet, OPC, and proprietary objects.
 - b. Provide a set of utilities that enable the trained engineer to properly edit, compile, upload, download, and debug application control software using Control Basic. The Control Basic Editor shall support all mathematical, logic, variable naming, and other functions described for DDC controllers described elsewhere in this specification.
 - c. Provide a library of manufacturer's standard applications that may be re-used, edited, re-compiled, modified, and implemented for standard HVAC, Energy Management, Lighting Control, and other functions as described for DDC controllers elsewhere in this specification.
 - d. It is a requirement of this system that a trained engineer can create customized sequences of operation for each piece of connected equipment and download that compiled sequence of operation into a target controller. It is also a requirement of this system that a trained engineer may upload an existing panel file or group of programs from an existing controller, de-compile it into source code for editing and modification. Systems that do not provide the ability for a trained engineer to execute these tasks on site or remotely shall not be acceptable.
 - e. Text strings of the original source code shall be color coded by function.
 - f. Programming shall be allowed while off-line from the connected network(s).
 - g. Provide the capability to allow remote technical support to the system via standard internet support shareware such as "Logmein" for remote support of customer systems.
 - h. Provide a "drag & drop" capability that allows an object, set of objects, panel file, or entire network to be copied and automatically downloaded from a file storage location into a corresponding on-line target device or set of devices with the click of a mouse button.
4. Set up & Configuration of trend logs
 - a. Provide a set of utilities that enable a trained engineer to properly set up and configure trend logs for archival storage of data and display at the B-OWS. This set of utilities shall define the points to be trended, display formats, initiation and termination features, alarm routing, and other properties using pre-formatted, fill-in-the-blank style forms for easy data entry.
 - b. Trend logs shall allow the combination of a minimum of 8 variables into one common group display.
 - c. Trend logs shall allow data to be accumulated automatically from trends stored in DDC controllers, on a polled basis with defined frequencies, or at the B-OWS workstation.
 - d. The engineer shall be able to define display axis range information, grouping of comparative points, and range of data to be accumulated.

5. Set up & Configuration of Alarms
 - a. Provide a set of utilities that enable a trained engineer to properly set up and configure all alarm properties in all DDC sub-system controllers or the B-OWS as appropriate.
 - b. Features include but are not limited to:
 - 1) Types of alarms
 - 2) Routing of alarms to one or more classes of recipients based on type of alarm, time of day, priority.
 - 3) Set up of email destination locations for alarm messages
 - 4) Programming of alarm points within DDC controllers including set up and configuration of:
 - a) Object to generate alarm
 - b) Custom alarm message
 - c) Limits and setpoints
 - d) Type of alarm
 - e) Etc.
 - c. Acknowledge, view and change permissions for each user.
6. Set up and configure Global Schedules
 - a. Provide a set of utilities that enable a trained engineer to create, modify, or delete customized global schedules. A global schedule is defined as a schedule that affects multiple locations, objects, pieces of equipment, or other groups of connected equipment.
 - b. Each global schedule shall provide the features of a BACnet schedule, calendar, or holiday object.
 - c. Each global schedule may be assigned to one or more objects, groups of objects, or pieces of connected equipment so that a change to the schedule value or state affects all connected equipment.
 - d. Such schedules may be implemented for daily, weekly, or annually for holiday events.
 - e. Once set up, the user may have full access in the B-OWS browser to make scheduling changes for at least one year in advance for annual schedules and weekly or daily for daily and weekly schedules.
7. User Security & Access Control
 - a. Provide a set of utilities that allows a trained engineer to create, modify, or delete the various sub-module permissions for each group of users.
 - b. Provide a minimum of 4 levels of user access control defined as "Supervisory", "Management", "Administrator", and "Operator". Within each group, provide the ability to individually enable or disable various permissions for a user to make changes such as changing setpoint values, acknowledging alarms, viewing trend information, etc.
 - c. Each user shall have a unique user name and password and be defined to a group or sub-group.
 - d. Each user, sub-group, or group shall be granted system access at a particular "home page" if desired to restrict access and capabilities within the operational portions of the BMS system.
 - e. "Lost password" protection shall be defined for each user with the use of a security question.
 - f. Passwords shall be allowed to have a defined expiry date to grant personnel temporary access if necessary.

- g. It shall be possible to define an unlimited number of users and duplicate user names shall be automatically identified.

2.5 BACnet Advanced Application Controller (B-AAC)

- A. Controls shall be microprocessor based BACnet Advanced Application Controllers (B-AAC) in accordance with the ANSI/ASHRAE Standard 135-2008. The Native BACnet AAC's shall be provided for Air Handling Units, Chilled and Hot Water Control, Unit Ventilators, Fan Coils, Heat Pumps, Variable Air Volume (VAV) Terminals and other applications as shown on the drawings. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. The system supplier must provide a PICS document showing the installed systems compliance level to the ANSI/ASHRAE Standard 135-2008.
- B. All Native BACnet B-AAC's shall be fully application programmable and shall at all times maintain their BACnet compliance. Controllers offering application selection only (non-programmable) are not acceptable. All control sequences within or programmed into the BACnet B-AAC's shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
- C. Whether stand-alone or networked, the BTL Listed Advanced Application Controllers (B-AAC) shall be used to provide direct digital control of HVAC equipment and other connected equipment. In addition to their standalone capabilities to execute the operating sequences described later in this document, they shall also be capable to be networked in a peer-to-peer, BACnet MS/TP field network to other BACnet B-AAC's, or as part of a complete facilities management system which integrates multiple field networks. These controllers may be used to optimize the energy consumption by implementing various Energy Management strategies such as demand limiting, duty cycling, outside air optimization, temperature setup/setback, optimum start/stop routines, etc.
- D. Standard features for all field devices features shall include:
 - 1. Stand-alone or networked peer-to-peer capabilities as MS/TP Masters; slave devices are not acceptable
 - 2. BACnet MS/TP LAN with configurable baud rate from 9600 to 76.8k baud
 - 3. All Inputs to be Universal Inputs with 10 bit resolution- software selectable as analog or digital with standard and custom ranges. Pulse counting shall be available for all inputs up to 16Hz frequency
 - 4. All Outputs to be Universal Outputs with 8 bit resolution - software selectable for analog or digital with standard and custom ranges
 - 5. 40 BV points and 40 AV points minimum
 - 6. Standard P, PI, or PID BACnet Loop Objects. Minimum of 1 Loop Object for each output.

7. Retains Last To Normal/To Off Normal Event for each object
8. 10 User definable program areas
9. 8 BACnet Trend Log Objects, minimum sample interval of 1 second
10. 8 BACnet Schedule Objects
11. 3 BACnet Calendar Objects
12. BACnet Intrinsic Alarm Reporting
13. Sensor conversion tables for creating linear curves
14. Compatible with "Microprocessor Based Space Sensor" specified below
15. For BACnet B-AAC's designed to control larger HVAC equipment including AHUs ≥ 20 Ton capacity, Exhaust Fans, Chiller Plants, and Boiler Plants, the following shall apply in addition to the standard features listed above:
 - a. Optional output cards all with Hand-Off-Auto switches and switch feedback for the following outputs:
 - 1) 24 VAC Zero crossing Triac
 - 2) N.C. Form A relay output
 - 3) N.O. Form A relay output
 - 4) 4-20ma with override potentiometer
 - 5) 0-10VDC analog output with override potentiometer
16. BACnet B-AAC's designed specifically for packaged unitary HVAC equipment including AHUs < 20 Ton capacity, FCUs, RTUs, heat pumps, and other unitary equipment,, the following shall apply in addition to the standard features listed above:
 - a. These controllers shall be designed for applications like zone devices and packaged type including, but not limited to, rooftop package air conditioners, heat pumps, or fan coil units.
 - b. Programmable control basic to allow customizing of the supplied application programs to suit the desired sequences of operation described later in this document, and possible changes to adapt to changing building conditions. The ability to only change operating parameters or substitute between configurable application shall not be considered acceptable
17. BACnet B-AAC's designed for VAV Controllers (VAVs), the following shall apply in addition to the standard features listed above:
 - a. Standard VAV control sequences are incorporated to provide pressure independent control of a single duct VAV unit
 - b. Each VAV Controller shall contain an integrated damper actuator
 - c. Each controller shall have an onboard flow-thru sensor for use with a single or multi-point differential pressure measuring station or pitot tube. The sensor shall utilize twin platinum ceramic resistance temperature sensors for control accuracy to within 3% of setpoint
 - d. Programmable control basic to allow customizing of the standard

sequences for temperature setback, overrides, proportional wet reheat, dual duct and other user defined sequences to adapt to changing building conditions. The ability to only change operating parameters or substitute between configurable application shall not be considered acceptable.

- e. Custom defined lookup tables
- f. When used in conjunction with the "Microprocessor Based Space Sensor" specified below, the balancing engineer shall be able to access all system information that is required for balancing, and shall be able to enter all parameters and adjustments required at the room sensor. No external device such as a PC or hand held operator interface device should be required. As a minimum, the following functions and readouts shall be available for use at the room sensor:
 - 1) Room temperature input value
 - 2) Current space setpoint
 - 3) Controller measured air flow
 - 4) Air Volume conversion factor
 - 5) Minimum air flow setpoint
 - 6) Maximum air flow setpoint
 - 7) Flow Sensor correction factor

E. B-AAC PACKAGING AND ENVIRONMENT - General B-AAC controllers mounted in panels, for Mechanical Room applications, or mounted within equipment as appropriate.

- 1. Distributed unitary controller enclosures (panels) shall be locking type, metal cabinet, with common keying. The panels shall have a metal print pocket suitable for storing wiring, service and log information. Indoor panels shall be NEMA 1 enclosures with gaskets. Any panels in cooling tower or chemically treated areas shall be stainless steel (Fiberglass enclosures rated for outside applications are acceptable). VAV box controllers shall have a safety cover but no enclosure is required.
- 2. The panel, when required, must functionally operate over a temperature range of 32 degrees F to 120 degrees F, and a humidity range of 0 - 95% non-condensing.
- 3. DDC panels shall come with a minimum of six pre-existing available knockouts for ease of wiring during installation.
- 4. The electrical requirements shall be identified and coordinated by the Controls Contractor. Any 110 VAC requirements are to be coordinated with Division 16 Contractor. The division 16 Contractor shall provide 110 VAC power circuits to each panel. 110 VAC power should not be installed in the same panel as 24 VAC. However, if 110 VAC power must be installed in the same panel with 24 VAC power due to design and/or system constraints, the 110 VAC side of the panel shall be physically isolated from the 24VAC side and clearly labeled. Use panduits in each control panel to conceal all wiring. Fuse all transformers.
- 5. Control panels shall be clearly identified by labels (2" lettering).

6. Provide and install as-built wiring diagrams to indicate the control points on all equipment. Also provide laminated point lists in all control panels.

2.6 MICROPROCESSOR BASED LCD Display SPACE (MBS) SENSOR

- A. The MBS Sensor shall connect directly to the BACnet AAC's and shall not utilize any of the I/O points of the controller. The MBS Sensor shall provide a communication connection to the controller. The MBS Sensor shall provide a communications jack for connection to the BACnet communication trunk to which the BACnet AAC is connected. The MBS Sensor, the connected controller, and all other devices on the BACnet bus shall be accessible by the Portable Operator's Terminal (POT). Microprocessor based sensors whose port only allows communication with the controller to which it is connected shall not be acceptable.
- B. The MBS Sensor shall provide a multi-segment LCD display containing a minimum of 50+ segments to display the following functions:
 1. Outside air temperature indication
 2. Space Temperature measurement and indication
 3. Space temperature setpoint adjustment
 4. Current time if option selected.
 5. Capability to view the value of any input or output in the system
 6. Capability to change the value of any input, output or software point in the system
 7. The above functions shall be field programmable if desired
 8. The MBS shall provide 8 buttons that may be used to display any of the values in the system mapped to that particular display button by application software.

2.7 BACnet Router (B-RTR) - Provide and install BACnet Multi-port routers containing the following requirements upon configuration of the router ports:

- A. General Functions
 1. Automatic routing of BACnet messages between BACnet IP, BACnet Ethernet, BACnet PTP, and BACnet MS/TP ports and sub-lan networks.
 2. 10BaseT and/or 100BaseT support of BACnet IP and BACnet Ethernet "Tier 1" networks.
 3. Auto selectable data rates of 9.6, 19.2, 38.4, and 76.8 Kbps of MS/TP (RS-485) type sub-Lan networks.
 4. Conformance to ANSI/ASHRAE standard 135-2008 for designated "router"

functions.

5. Support of BACnet IP packet assembly/disassembly (PAD) routing.
6. Foreign Device Registration with BACnet Broadcast Management Devices (BBMD).

B. Physical/Virtual Port Requirements

1. 10BaseT/100BaseT Ethernet connection to structured cabling/Ethernet/IP environments
2. (4) EIA-485 serial ports for connection to MS/TP ports
3. (2) EIA-232 serial port for connection to EIA-232 BACnet devices
4. (1) Dial-Up PTP port for dial up connections with external modem.

C. Memory Requirements

1. 2 MB non-volatile Flash memory
2. 2 MB RAM memory
3. RAM memory automatically backup up to Flash memory every 6 hours.

D. Configuration tools & software

1. Provide BACnet Router Configuration Tools with router on CD that installer may use to properly install and configure BACnet and internet port requirements. Software shall provide GUI of "fill-in-the-blank" forms for installer to rapidly configure each port, network, or sub-network, foreign device registrations, etc.
2. Router shall "self-discover" and display lists of connected devices for each logical network.
3. Router shall display real-time status of communications with each connected device on each network in an easy to understand, tabular, English language display.

E. Physical Characteristics

1. Panel Mounted device with EIA standard port connections.
2. 120/240 VAC power supply.
3. 32 - 122F operating temperature, 0 - 95% relative humidity, non-condensing environments.

F. Acceptable Manufacturers

1. KMC Controls - Model BAC-5050, 5051

2.8 TRANSIENT (SURGE) PROTECTION

- A. All communication channels between PC, Routers and Unitary Controllers whether in conduits or overhead runs, shall have transient suppression networks installed. The transient (Surge) protection must meet IEEE standard C37.90a-1974. The suppression network shall be automatic, self-restoring and be on active duty at all times.
- B. Surge suppression shall comply at a minimum with manufacturer's requirements and shall include suppression on all lines entering and leaving each building.

2.9 OTHER CONTROL SYSTEM HARDWARE

- A. Control Dampers (where furnished by the Temperature Control sub-contractor): Dampers shall be black enamel finish or galvanized, with nylon bearings. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel iron. Dampers with both dimensions less than 18 inches may have strap iron frames.
- B. Electronic Control Actuators: Furnish and install direct-mount type valve and damper actuators of the following types and capacities:
 1. Size all actuators in damper applications to provide a minimum of 5 in-lb torque per square foot of damper area. Provide one actuator per damper minimum.
 2. Size all actuators in valve applications to provide shut off against rated system pressure + 25% over pressure.
 3. Control Input Signal: Two-position, 3-point floating, or proportional electric actuators as required for the application. All 3-point floating point actuators shall provide proportional (0 - 5VDC or 0 - 10VDC) feedback signal of damper position.
 4. Damper actuators shall be capacitive or spring return failsafe type for the following applications:
 - a. All fresh air, return air, and exhaust air applications
 - b. Floor dampers
 - c. Smoke Control Damper actuators not provided with combination smoke and fire control dampers.
 5. Valve actuators shall be capacitive or spring return failsafe type for the following applications:
 - a. Chilled water coil applications for all air handling applications where outside air dampers are present.
 - b. Hot water coil applications for all air handling applications where outside air dampers are present.
 - c. Hot water reheat coil applications.
 - d. Humidifier applications

- e. Chilled water, hot water, cooling tower isolation valves.
6. Provide actuators with optional position end switches as shown on the drawings, indicated in the points list, or as required by the sequence of operation. Optional end switches shall be dry contact type with minimum contact rating of 24VAC, 1Amp, pilot duty rating.
 7. Provide actuators with proportional voltage (0- 5VDC or 0-10VDC) as shown on the drawings, indicated in the points list, or as required by the sequence of operation.
 8. Provide integral failsafe capacity as required with actuators up to 320 in-lb. torque rating. Manufacturers that cannot meet this rating shall furnish and install sufficient actuators at each location to meet the maximum calculated torque requirement.
 9. Actuators shall contain a microprocessor controlled operating algorithm that prevents "dithering" when controlled by a DDC control system. The "anti-dithering" algorithm shall prevent movement from an input control signal change in the opposite direction for a minimum of +/- 2% of span.
 10. Actuators shall contain a manual clutch release that allows manual release and positioning of the actuator.
 11. Actuators shall contain physical indication of actuator rotation position.
 12. Actuators shall contain a microprocessor controlled sequence that automatically ranges the actual full stroke movement of the controlled element (damper or valve stem) over the full 0-100% input range of the control input signal. Manufacturers that cannot provide this feature shall provide KMC actuators in their price without exception.
 13. Actuators shall be switch selectable for clockwise and counterclockwise rotation.
 14. Failsafe models shall be switch selectable for clockwise or counterclockwise rotation on failure of power.
 15. Actuators shall contain a manual stop that is installer adjustable over a range of 45 - 95 degrees of rotation.
 16. Actuators shall nominally provide full stroke rotation within 60 seconds over a 95 degree stroke. Actuators for smoke damper applications shall conform to the time requirements of UL-864, Category UUKL.
 17. Actuators shall be rated by the manufacturer for a minimum of 60,000 end-to-end full rated load cycles and carry a 60 month (5-year) operating warranty from date of manufacture.
- C. Control Valves: Control valves for all applications other than VAV terminal reheat and FCU operations shall be 2-way or 3-way pattern as shown on the drawings and

meet the following performance criteria:

1. Bronze or brass bodies with "screwed" ends for valves of up to 3" diameter. Valves shall be rated with a minimum of 250 psi static body rating for fluid temperatures at 200F and up to 400 psi static body rating for fluid temperatures at 40F.
2. Cast iron or ductile iron bodies with flanged ends for valves > 3" diameter and optional for valves of 2 -1/2 and 3" diameter. Valves shall be rated with a minimum of 125 psi static body rating for fluid temperatures at 200F.
3. Valves for coil control applications with the exception of VAV, FCU and unit heaters shall be characterized ball valve type and constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Valves shall meet the following operating performance characteristics:
 - a. Ball valve type containing characterized flow control insert with equal percentage flow operation over 0 - 100% input signal.
 - b. Valves < = 3" shall be equipped with a chrome plated brass ball and with chrome plated brass ball and characterizing insert on the interior of the ball to prevent erosion in high differential pressure applications. Valves 4" and above shall be provided with a stainless steel ball, laser cut characterizing plug.
 - c. Valve shall effectively operate over a range of up to 60 psid.
 - d. Plug, ball and stem shall be replaceable for all valves up to 3" diameter.
 - e. Valve shall have replaceable packing.
 - f. Valve shall properly operate in water treated with "azole" oxygen scavenging chemicals at concentrations of up to 10%.
 - g. Valve throttling turn down range shall be rated at 500:1 for valves up to 3" diameter and 300:1 for valves greater than 3".
 - h. Acceptable manufacturers shall be:
 1. KMC Controls
 2. Belimo
4. Valves for chiller, boiler, cooling tower, and other isolation applications.
 - a. Butterfly type, 2-way or 2-way body pattern to meet the application
 - b. "Bubble-tight" shut off for actuators up through 10" diameter 2-way applications and 8" 3-way applications. Valves shall be provided with EPDM rubber seals.
 - c. Electronic capacitive or spring return failsafe.
 - d. Proportional (0 - 5VDC or 0 - 10VDC) position feedback indication of stroke position.
 - e. Acceptable manufacturers shall be:
 - 1) KMC Controls
 - 2) Belimo
 - f. Valve requirements larger than 8" 3-way or 10" 2-way size shall be provided by a vendor specializing in the design, fabrication, and delivery of such valves as submitted by the FMCS contractor.
5. Two-position valves shall be 'line' size. Proportional control valves shall be

sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Valve bodies shall not be selected that are more than 1 line size smaller than pipe size.

6. Valves with sizes up to and including 2 inches shall be "screwed" configuration. Valves > 2" diameter shall be provided with screwed to flange "companion flanges" if required by the mechanical contractor. Ductile or cast iron valve bodies 2-1/2 inch and larger valves shall be "flanged" configuration.
- D. Duct Mount, Pipe Mount and Outside Air Temperature Sensors: 10,000-ohm @ 77F Type III thermistor temperature sensors with a sensing accuracy of $\pm 0.2^{\circ}\text{C}$. Device shall be provided with integral 2x4" conduit wiring box and sensing elements shall be protected in filtered sensor probe housing. Outside air sensors shall include an integral sun shield.
 - E. Combination Duct Temperature & Humidity sensor/transmitters: 10,000-ohm @ 77F Type II thermistor temperature sensors with a sensing accuracy of $\pm 0.2^{\circ}\text{C}$. Humidity transmitter shall provide a 0 - 5VDC or 0-10VDC output over 0-100% operating range at a sensing accuracy of $\pm 2\%$ humidity. Device shall be provided with integral 2x4" conduit wiring box and sensing elements shall be protected in filtered sensor probe housing. Outside air sensors shall include an integral sun shield.
 - F. Static Pressure Sensor/Transmitters - Duct mounted device containing electronics in wiring enclosure and integral duct pressure sensing probe. Switch selectable models for $\pm 0.5"$ to $2"$, $\pm 1.5"$ to $6"$ and $\pm 2.5"$ to $10.0"$ WC and equivalent metric variations. Each device contains 4 switch selectable ranges. Proportional 0 - 5VDC, 0-10VDC, or 4-20mADC control signals. Temperature compensated over 50 - 122F (10 - 50C) operating temperature range with $\pm 1\%$ FSO stability per year.
 - G. Liquid Pressure Sensor/Transmitters - Wet/wet pressure transducer with 4 switch selectable operating ranges in ranges of 0 - 50 psig/d, 0-100 psig/d, and 0-500 psig/d ranges. Useable in any gas or liquid compatible with 17-4 PH stainless steel. Push button or remote zeroing integral to unit. High/low port swap switch to solve incorrect plumbing for differential. Integral 4 or 8 second surge damping switch. Proof pressure 2x range, Burst pressure 5x operating range. $\pm 1\%$ FS accuracy combined linearity, hysteresis and repeatability.
 - H. Carbon Dioxide Sensors - Duct or Space application, 5 year calibration accuracy, 0 - 2000ppm range $\pm 5\%$ accuracy over range. Optional LCD display, integral self-calibration algorithm. Meets ventilation requirements of ASHRAE standard 62-1999. Programmable altitude correction in 500' elevation increments. Repeatability $\pm 20\text{ppm}$, stability $\pm 20\text{ppm}$ typical with 5 year re-calibration interval.
 - I. Carbon Monoxide Sensor - Duct or space application, 0-300ppm range, $\pm 7\%$ accuracy. Models with sensor, sensor, alarm relay, and audible alarm to meet application requirements. 0-5VDC, 0-10VDC, or 4-20maDC proportional output signal, self contained in housing containing all electronics and wiring enclosure.
 - J. Occupancy Sensors - PIR type, with minimum 33' (10 meter) sensing range over spherical 160 degree sensing window. Response time to occupancy change shall be < 1 second.

Wall or ceiling mounted as shown on the plans to suit application. Provide and install external power supply for devices as required.

- K. Control Transformers - UL Class 2 rated with primary and secondary voltages to suit applications.
- L. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.
- M. Water Flow Meters (when required): Water flow meters shall be axial turbine style flow meters which translate liquid motion into electronic output signals proportional to the flow sensed. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag. Flow meters shall be 'insertion' type complete with 'hot-tap' isolation valves to enable sensor removal without water supply system shutdown. Accuracy shall be $\pm 2\%$ of actual reading from 0.4 to 20 feet per second flow velocities.
- N. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the temperature control system manufacturer or its exclusive factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of the local exclusive factory authorized temperature control contracting field office (branch or representative).
- B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- C. Drawings of temperature control systems are diagrammatic only and any apparatus not shown, such as relays, accessories, etc., but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.
- D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Temperature Control sub-contractor in accordance with these specifications.

- E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Temperature Control sub-contractor.
- F. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.2 WIRING

- A. All electrical control wiring and power wiring to the control panels shall be the responsibility of the FMCS contractor.
- B. The electrical contractor (Div. 16) shall furnish all power wiring to electrical starters and motors.
- C. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 16) unless otherwise allowed by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance. Manufacturer shall provide a warranty for all provided FMCS equipment of 1 years to the original owner of the FMCS system through the Manufacturer's authorized installing contractor.
- B. Within this period, upon notice by the Owner, any defects in the FMCS due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the Temperature Control sub-contractor at no expense to the Owner

3.4 WARRANTY ACCESS

- A. The Owner shall grant to the Temperature Control sub-contractor, reasonable access to the FMCS during the warranty period. The owner shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

- A. Upon completion of the installation, the Temperature Control sub-contractor shall load all system software and start-up the system. The Temperature Control sub-contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

- B. The Temperature Control sub-contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.
- D. System Acceptance: Satisfactory completion is when the Temperature Control sub-contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the FMCS hardware and software has been established the Temperature Control sub-contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The Temperature Control sub-contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the FMCS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.
- C. The training shall be in three sessions as follows:
 - 1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
 - 2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
 - 3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

END OF SECTION

SECTION 328400 – PLANTING IRRIGATION

1.1 WORK INCLUDED

- A. The work included in this section consists of installing a complete underground irrigation system as shown on the drawings and as herein specified, including the furnishing of all labor, materials, taxes, permits and fees necessary in performing all operations in connection with construction of the irrigation system.

1.2 RELATED WORK

- A. Finish Grading
- B. Trees, Shrubs, and Groundcovers
- C. Hardscape Features

1.3 QUALITY ASSURANCE

- A. All Federal, State, and Local Governing Agency requirements and industry standards applicable to this section are hereby made part of this specification, as fully as if repeated herein.
- B. Work shall not commence until all permits applicable to this section have been secured.
- C. The Owner's representative shall have the right at any stage of the operation to reject any and all work and material, which in his opinion do not meet the requirements of these Specifications. Such rejected material shall be immediately removed from the site and acceptable material substituted in its place.

1.4 GUARANTEE

- A. The Contractor shall guarantee the irrigation system for a period of one year from the date of final acceptance against defects and malfunctions in equipment and against faulty workmanship. The guarantee shall be submitted in writing to the Owner.

1.5 PROTECTION

- A. The Contractor shall provide and maintain all necessary safeguards for the protection of the public and shall protect all materials and work against damage from any cause. The Contractor shall be held responsible for any damage or injury to persons or property, which may occur as a result of his negligence in the performance of the work.

1.6 EXISTING CONDITIONS

- A. The plans show conditions as they are believed to exist. The Contractor shall inspect the job

site prior to the bid submittal and shall promptly notify the Owner's representative of variances between the plans and actual conditions.
- B. Prior to commencing any work required under the Contract, the Contractor shall locate all utilities, subsurface drainage and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements.

- C. The Contractor shall be responsible for repairing immediately at his own expense any damage to the work of others which is caused by the Contractor in the course of his work, including but not limited to utilities, structures, pavement, proposed and existing grades, proposed and existing vegetation, etc.
- D. Occasional objectionable materials such as old concrete, bricks, or other debris encountered during the installation operations shall be disposed of. Extensive debris shall be brought to the attention of the Owner's representative.
- E. The Contractor shall be responsible for coordinating his work with all other parties involved with the job in order to eliminate unnecessary conflicts during the installation of his work.

1.7 MATERIALS

A. Pipe

- 1. Mainline pipe - EXISTING
- 2. Lateral pipe shall be PVC Sch. 40 solvent weld pipe.
- 3. Riser pipe shall be grey Sch. 80 PVC threaded nipples.
- 4. Flexible swing joint pipe shall be PVC Flex pipe.
- 5. Sleeves shall be PVC Sch. 40
- 6. All above ground pipe in association with a pump or backflow preventer shall be Sch. 40 galvanized steel pipe.

B. Fittings

- 1. Fittings for use with PVC pipe shall be PVC Sch. 40.
- 2. Fittings for use with galvanized steel pipe shall be Sch. 40 galvanized steel.
- 3. PVC pipe shall be joined to steel pipe with a male PVC threaded adapter inserted into steel coupling.

C. Equipment

- 1. All irrigation sprinklers, valves, controllers and other equipment shall be as shown on the drawings.

D. Miscellaneous

- 1. Valve boxes shall be Brooks #38-T 12" concrete box with cast iron cover.
- 2. Control wire shall be UF-type, direct burial wire.
- 3. Underground wire splice connectors shall be King Brothers connectors or approved equal.
- 4. Gravel for bedding of below grade valve installations shall be ½" to 1" diameter, washed brown river gravel.

1.8 GENERAL

- A. Pipe line positions indicated on the plans are generally schematic and shall be field adjusted by the Contractor to avoid existing and proposed trees and other obstacles and to share trenches with adjacent parallel lines where possible.

1.9 PREPARATION

- A. The Contractor shall verify through the Owner's representative that rough grades have been set prior to the installation of the irrigation system.
- B. The Contractor shall stake the location of pipe runs, sprinklers, and valves to determine potential conflicts with unforeseen obstacles, inconsistencies between plans and field conditions, and plan errors prior to trenching. If such conflicts are encountered, the Contractor shall notify the Owner's representative prior to proceeding.
- C. The Contractor shall review the Landscape Plans to determine the locations of proposed trees and shrubs prior to trenching. Trees and shrubs shall take precedence over pipe locations in the event of conflict. Contractor shall relocate conflicting pipes.

1.10 INSTALLATION

- A. Trenches shall be cut with vertical sides and be sufficiently wide to provide free working space around the work installed, and to provide ample space for backfilling and tamping. Trench bottoms shall provide uniform bearing for the full length of the line and shall be free of rock and other sharp edged objects. Minimum depth shall be eighteen inches (24") for main lines and twelve inches (12") for lateral lines. All pipe lines shall have four inches (4") minimum clearance from each other and eight inches (8") minimum clearance from lines of other trades.
- B. PVC pipe shall be cut square with a saw or cutter. Burrs at cut ends shall be removed prior to installation for smooth unobstructed flow.
- C. The Contractor shall use only the solvent recommended by the pipe manufacturer. All PVC pipe and fittings shall be installed per manufacturer's instructions. Joints shall be allowed to set at least 4 hours before pressure is applied to the system.
- D. Valve boxes shall be installed flush with finish grade taking into account the thickness of sod and mulch. Valves shall be centered within the valve box both horizontally and vertically. After all adjustments have been made and immediately prior to final inspection, 3" to 4" gravel layer shall be placed in the bottom of the valve box for a finished appearance.
- E. Pop-up sprinklers shall be installed plumb and flush with finish grade taking into account the thickness of sod and mulch. Riser mounted sprinklers shall be mounted even with initial height of shrub, allowing for riser extension as shrubs mature.
- F. All wire splices are to be made with approved connectors inside valve boxes only. Wire shall be bundled and taped every ten feet and shall be installed in the main line trench.
- G. Initial backfill within a 4" radius of the pipe shall be clean soil or sand, free of foreign matter. Backfill shall be compacted to dry density equal to adjacent undisturbed soils, and shall conform to adjacent grades without dips, lumps, or other irregularities.
- H. When main line is 4" or larger, concrete thrust blocks of appropriate volume shall be placed at all tees and ells. Thrust blocks shall be poured concrete placed against compacted earth and pipe to prevent movement of pipe within the soil.

1.11 TESTING

- A. All Main Lines shall be tested prior to backfill of joints. Slowly fill the main line piping with water, taking care to purge the air from it by operating all of the control valves one

or more times and/or such other means as may be necessary. Allow the pipe to sit full of water for 24 hours to dissolve remaining trapped air. Use a metering pump to elevate the water pressure to 100 PSI and hold there for a period of 2 hours. PVC solvent-weld pipe connections should have no leakage. If the test indicates leaks in the system, locate and repair the leak, then retest the pipeline until it passes the test. Any covered pipe found to leak, shall be excavated and repaired at the Contractor's expense.

- B. All Lateral Lines shall be tested prior to backfill of joints. Testing shall be conducted during the operational testing of the system by visually inspecting the joints and the ground surface along trench lines. All leaks found shall be repaired by the Contractor at his expense and the system shall then be retested.
- C. Operational Test: The entire installation shall be placed in operation by this Contractor and tested in the presence of the Owner or his Representative for proper functioning as a whole. Location and arc of heads shall be adjusted if required to eliminate any dry spots, over-water or spillage on adjacent areas and to prevent over spray onto walks, roadways and buildings as much as possible.

1.12 FIELD QUALITY CONTROL

- A. The Owner's representative shall inspect the work at any time during the course of the construction activities to verify adherence to the plans and specifications.
- B. Upon completion of the work, the work will be inspected by the Owner's representative. The Contractor shall notify the Owner's representative at least seven days prior to the anticipated inspection date.
- C. At the time all work is found to be acceptable, a letter of acceptance or certificate of final acceptance will be issued stating the date the guarantee period shall begin. Minor deficiencies shall be rectified within 3 days of the inspection date. If there are significant deficiencies found during the inspection, such work shall be corrected prior to the issuance of the letter of acceptance.

1.13 CLEANING

- A. The Contractor shall at all times keep the premises free from accumulations of waste materials or rubbish caused by his employees or work. All waste materials shall be disposed of properly off-site.

END OF SECTION - 328400

SECTION 329200 - TURF AND GRASSES

1.1 SCOPE

- A. Perform all work necessary for installing sod and/or seed as shown on the drawings or inferable there from and/or as specified, in accordance with the requirements of the Contract Documents.

1.2 QUALIFICATIONS

- A. Lawn sodding and related work shall be performed by a firm with a minimum of three years (3) experience specializing in this type of work.

1.3 COMPLIANCE WITH REGULATIONS

- A. Comply with all Federal and/or State Regulations concerning Classification or transportation of sod and fertilizer materials.

1.4 SOIL STERILANTS

- A. No sod or seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials. The Contractor shall assume full responsibility for any loss or damage to sod or seed arising from improper use of sterilants or due to his failure to allow sufficient time to permit dissipation of toxic materials, whether or not such sterilants are specified herein.

1.5 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 and 2 Specification Sections apply to this Section.

1.6 SOD

- A. Class of Sod and Composition - The sod used shall be 97% weed free. It shall be nursery grown and well rooted. Sod shall be subject to review by the Landscape Architect prior to being cut and again before it is laid. The consistency of adherent soil shall be such that it will not break, crumble, or tear during handling and placing of the Sod.

1. Each piece of sod shall be well covered with turf grass, shall be free from noxious weeds and other objectionable plants and shall not contain substances injurious to growth. The grass shall be mown to a length of no less than one and one-half inch (1 1/2") nor more than four inches (4") before the sod is cut.

2. All sod used shall comply with State and Federal laws with respect to inspection for plant diseases and insect infestation. An inspection certificate, required by law to this effect, shall accompany each shipment, and on arrival shall be filed with the Landscape Architect.

3. Soil of the sod to be used shall be loamy sand and compatible with the soils of the project. No muck or heavy peat soil grown sod will be accepted, unless otherwise specified.

- B. Thickness of Cut - Sod shall be machine cut at a uniform soil thickness of three-fourths inch (3/4"), plus or minus one-fourth inch (1/4"), at the time of cutting. Measurement for thickness shall exclude top growth and thatch.
- C. Pad Size - individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be five percent (5%). Broken pads and torn or uneven ends will not be acceptable.
- D. Strength of Sod Sections - Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper ten percent (10%) of the section.
- E. Moisture Content - Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
- F. Time Limitations - Sod shall be harvested, delivered and installed within a period of forty eight (48) hours. Sod not transplanted within this period shall be inspected prior to its installation.

1.7 SEED

- A. Seed shall be true to species as called for on the seeding plans. It shall be domestically grown and comply with current State and Federal regulations purity.
- B. All seed shall be delivered to the job site in sacks plainly marked and certified as to content.
- C. Germination rate of all seed shall be not less than sixty-five percent (65%) and no seed with an excess of five percent (5%) weed seed shall be used.

1.8 CLEAN UP

- A. Prior to seeding or sodding, the surface shall be cleared of all trash, debris and stones larger than one inch (1") in any dimension, and of all roots, brush, wire, grade stakes and other objects that would interfere with planting or maintenance operations.
- B. The Contractor shall verify grades during final soil preparation as being true to finish contours shown, and shall maintain such areas until the effective date to begin sodding and/or seeding operations. In such instances where a split responsibility exists between grading and grassing contractors, it shall be the responsibility of the grassing contractor to maintain a suitable grade for grassing once he has accepted the grade provided to him.
- C. In all cases the ground shall be hand raked immediately prior to being sodded to remove any irregularities in the grade.

1.9 SODDING OPERATIONS

- A. Sodding Time Sod shall be placed when the ground is in a workable condition and temperatures are less than ninety degrees (90) Fahrenheit. Sod shall not be place during extended drought, unless irrigation is available.
- B. Transportation Sod shall be in a moist condition at the time of cutting and shall be kept in a moist condition until it is placed. Any sod that has dried out will be rejected and

shall be immediately removed from the job site by the Contractor. All sod shall be transported in either a closed van or in open truck properly covered. Sod cut for more than forty-eight (48) hours shall not be used without the concurrence of the Landscape Architect. All sod shall be kept moist and protected from exposure to sun, wind and freezing prior to placing.

- C. Misting the Soil During periods of high temperature and after all unevenness in the soil surface has been corrected, the soil shall be lightly irrigated immediately prior to laying the sod.
- D. Starter Strip The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would cause air drying of the roots.
- E. Sloping Surfaces In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of the water ditch. On slopes, starting at the bottom of the slope, the sod shall be laid with the longer dimension parallel to the contours of the ground. The exposed edge of the sod shall be buried flush with the adjacent sod. On slopes where the sod may be displaced during sodding operations, the workman shall work from ladders or treaded planks.
- F. Staking Sod The sod shall be staked on all slopes of 2:1 or steeper. Sod shall be staked with not less than four (4) stakes per square yard with at least one stake for each piece of sod. Stakes shall be lath or similar material, pointed, and driven with the flat side against the slope, six inches (6") into the ground, leave approximately one-half inch (1/2") of the top above the ground.
- G. Water and Rolling The Contractor shall water sod immediately after installation to prevent excessive drying during progress of the work. As sodding is completed in any one section, the entire area shall be rolled. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad and soil immediately below the sod are thoroughly wet.
- H. Supplemental Watering During periods of intense heat or abnormal rainfall, supplemental water may be required prior to acceptance of the work. When supplemental watering is required, Water shall be applied at the rate specified by the Landscape Architect or Owner.
- I. Disposal of Surplus Material Surplus and waste materials resulting from sodding operations shall be disposed of by the Contractor at his expense.

1.10 SEEDING OPERATIONS

- A. Immediately prior to seeding the ground shall be scarified and raked to provide a friable fine texture.
- B. Lawn areas shall be seeded with a mechanical spreader at the rate of application of five pounds per one thousand square feet (5 lbs/1000 sq. ft.) for Bahia grasses. Application rates for other grasses shall be specified in supplemental specifications.
- C. After seeding, all areas shall be raked and rolled to satisfactorily cover seed, and then thoroughly watered.

- D. The method of seeding may be varied by the contractor on his own responsibility to establish a smooth uniform turf.

1.11 GUARANTEE AND ACCEPTANCE

- A. The guarantees for all sod and/or seeding is that it must be alive and in satisfactory growth at the end ninety (90) days, providing appropriate maintenance has been provided by the owner. If improper maintenance is being provided the Contractor shall notify the Owner in writing, with a copy to the Landscape Architect, as to what steps are necessary to be taken.
- B. Acceptance by the Owner shall be made at such time as grassing operations have been completed and reviewed by the Landscape Architect. At the end of ninety (90) day guarantee period a final review shall be made by the Landscape Architect as to acceptability of all lawn areas. Any seed areas over one foot square not covered by turf shall be re-seeded by the Contractor. Any sodded areas over one foot square that are dead or dying shall be re-sodded by the Contractor.

END OF SECTION 329200

SECTION 329300 – PLANTS

1.1 DESCRIPTION OF WORK:

- A. Furnish all materials, equipment and labor as necessary for preparation of planting areas, soil treatment, planting of trees, shrubs, groundcovers and grass, relocation of designated plants, protection of plants, maintenance, guarantee and replacement of plants, and related items as required to complete the work as indicated on the drawings and specified herein.

Related Work:

- 1. Section 328400: Planting Irrigation.

1.2 DEFINITIONS:

- A. The following words and terms or pronouns used instead shall wherever they appear in these specifications, be construed as follows, unless a different meaning is clear from the context:

"Final Acceptance" shall mean that point in time when all requirements of project drawings and specifications are completed, including any punchlist items, to the satisfaction of the Landscape Architect. The contractor shall be notified in writing of final acceptance by a Landscape Architect.

"Warranty Period" shall be a six month period beginning at Final Acceptance.

"Maintenance Period" shall begin when plant material is installed and continue for ninety (90) days after notification of Final Acceptance.

"Final Maintenance Inspection" shall occur at the end of the ninety (90) day maintenance period.

1.3 QUALITY ASSURANCE:

- A. The landscape installation shall be by a single firm specializing in landscape work.
- B. Plant names indicated shall comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed shall conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.
- C. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock" (ANSI Z60 1) and, sizing and grading standards of the latest edition of "Grades and Standards for Nursery Plants: Part I and II" by the Florida Department of Agriculture and Consumer Services. All plant material shall be "Florida No. 1" or better.
 - 1. Caliber measurement shall be taken six (6) inches above ground level if four (4) inches or less. If greater than 4 (four) inches, caliber measurement will be taken at twelve (12) inches above ground level.
- D. Do not make substitutions. If specified landscape material is not obtainable submit to Landscape Architect in writing, proof of non-availability and proposal for use of equivalent material. When authorized, adjustment of contract amount will be made.

- E. All plants shall be nursery grown and 100% acclimatized to local planting conditions.
- F. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, providing that the larger plants will not be cut back to size indicated or rootbound in pots. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated. Height and spread specified will prevail over container size specified, for groundcover and shrub material only.
- G. All trees will be inspected and approved by the Landscape Architect at the place of growth, for compliance with specification requirements for quality, size, and variety. When trees cannot be obtained locally, provide sufficient photographs of the proposed plants for approval.
 - 1. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.
 - 2. Tag trees at the source of supply prior to inspection by Landscape Architect.

1.4 SUBMITTALS:

- A. Submit planting schedule showing scheduled dates for each type of planting in each area of site two weeks prior to beginning work.
- B. Submit certificates of inspection, as required by governmental authorities, and manufacturers or vendors certified analysis for soil amendments, herbicides, insecticides and fertilizer materials, submit other data substantiating that materials comply with specified requirements.
- C. Submit the following material samples:
 - 1. Mulch
 - 2. Topsoil with verification of sterilization and source.
 - 3. One typical sample of each shrub and groundcover material as specified, prior to planting for approval.
 - a. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.
- D. Upon final acceptance of plant material, submit two (2) written maintenance instructions recommending procedures for maintenance of plant materials for a one year period.
- E. Provide landscape planting as-built drawings:
 - 1. Legibly mark drawings to record actual installation.
 - 2. Identify field changes of dimension and detail and changes made by approving authority.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.

- B. B&B Trees must be held and fully acclimatized over a period not less than eight (8) weeks prior to delivery to site.
- C. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately prior to digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order. Upon arrival the certificate shall be filed with the appropriate City of Tampa department. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Landscape Architect. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
- D. Plant material that is stored improperly shall receive a special review of acceptance/rejection, established on a case by case basis.
- E. Cover plants transported on open vehicles with a protective covering to prevent windburn.
- F. Topsoil shall be kept dry and loose for planting bed mixes.
- G. Label at least one (1) tree and one (1) shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

1.6 JOB CONDITIONS:

- A. Work notification: Notify Landscape Architect at least seven (7) working days prior to installation of plant material. All plant samples to be reviewed for approval prior to notification.
- B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations. Notify any affected utilities 48 hours prior to beginning work, if applicable.
- C. A complete list of plants, including a schedule of sizes, quantities, and other requirements are shown on the drawings. In the event that quantity discrepancies or material omission occur in the plant materials list, the planting plans shall govern.
- D. Examine the subgrade, verify the elevations, observe the conditions under which work is to be performed, and examine unsatisfactory conditions before proceeding with the work.
 - 1. When conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions or obstructions, notify Landscape Architect before planting to determine alternative action.
 - 2. Contractor shall be responsible for the removal of existing vegetation deemed necessary by Landscape Architect to carry out scope of project.
- E. The irrigation system shall be installed prior to planting, if applicable. Locate, protect and maintain the irrigation system during planting operations. Repair irrigation system components, new and existing, damaged during planting operations with like materials. Test system prior to installation of plant material.
- F. Any work taking place along a city, county or state road or median must comply with

appropriate regulating authorities' guidelines for "Traffic Controls for Construction and Maintenance Operations". Contractor shall be responsible to file and obtain any and all required agency permits.

1.7 MATERIALS:

- A. Plants: Provide plants typical of their species or variety; with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasion of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces.
 1. All plant material shall be "Florida No.1", or better.
 2. Dig balled and burlapped plants with firm, natural balls of earth of diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Cracked or mushroomed balls are not acceptable.
 3. Container-grown stock: Grown in container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
 - a. No plants shall be loose in the container.
 - b. Container stock shall not be pot bound.
 4. Trees with included bark will not be accepted. Trees shall have a minimum of five (5) feet of trunk free from branching, unless otherwise specified.
 5. Sanding of palm tree trunks will not be accepted. Palm tree fronds shall be tied up to protect bud from stress and damage. Fronds shall be tied with a material that will decompose naturally.
 6. Plants planted in rows shall be matched in form.
 7. Plants larger than those specified in the plant list may be used when acceptable to the Landscape Architect.
 - a. If the use of larger plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.
 8. The height of the trees, measured from the crown of the roots to the average height of the top of the tree, shall not be less than the minimum size designated in the plant list. Container size designated, if any, shall be minimum size required.
 9. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.
 10. Height and spread requirements, of shrub and groundcover material, indicated in the plant list shall prevail over container size indicated, unless otherwise specified.
 11. Shrubs and small plants shall conform to the following standards:

- a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
- b. Single stemmed or thin plants will not be accepted.
- c. Side branches shall be generous, well-twiggged, and the plant as a whole well-bushed to the ground, unless otherwise specified.
- d. Plants shall be in a vigorous condition, free from dead wood, bruises, or other root or branch injuries.

12. Any plant material showing signs of shock will be judged on a case by case basis for acceptance or rejection.

1.8 ACCESSORIES:

- A. Refer to drawings and other portions of specifications for accessories specifically used on this project.
- B. Topsoil for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range between pH 5.5 and 6.5. Mixture 50% course native sand and 50% peat as specified.
 - 1. Expressly identify source location of topsoil and/or peat proposed for use on the project.
 - 2. Provide topsoil free of substances harmful to the plant material. Topsoil shall be sterilized.
- C. Peat: Brown to black in color, sterile, weed and seed free granulated raw peat, containing not more than 9% mineral on a dry basis.
- D. Fertilizer shall be complete with the following analysis and source compounds:
 - 10% nitrogen derived from ammonium nitrate.
 - 2% phosphorous derived from super phosphate.
 - 10% potassium derived from potassium sulfate.
 - 4% magnesium derived from magnesium sulfate.

The fertilizer shall be neutral and contain the essential micro-nutrients (Chelated Fe, Mn, Zn, Mo, Bo, Cu) in sulfates unless otherwise indicated in ppm. Fertilizer shall be slow release.
- E. Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.
- F. Mulch shall be derived from an invader tree species (unless specified otherwise on drawings) clean, bright and free from weeds, moss, sticks and other debris. Mulch shall be spread at minimum of two (2) inches deep and maximum of four (4) inches deep or as otherwise noted.
- G. Water: Free of substances harmful to plant growth. Water shall

contain less than 300 ppm soluble salts and less than 10 ppm chlorine, fluoride and sodium. Hoses or other methods of transportation furnished by Contractor. Contractor shall furnish water supply from an acceptable source. Acceptable sources: deep wells, municipal potable supply and treated wastewater.

- H. Guys: All trees between 2" and 4" caliber shall be guyed using a 3/4" rubber elastic guy system such as Arbortape or Tree Saver. Attach fluorescent flagging to guys, minimum 18" length.
- I. Pre-emergent weed killer: Apply 2: granular "Chipco" Ronstar or approved equal, at a rate recommended by manufacturer.

1.9 INSPECTION:

Contractor shall examine proposed planting areas and conditions for installation. Do not start planting work until unsatisfactory conditions are corrected.

1.10 PREPARATION:

- A. Time of planting.
 - 1. Deciduous material: If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.
- B. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.
- C. Layout of individual tree locations shall be performed by the Landscape Architect prior to starting work at each site. Give 48-hour notice of need for inspection. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected. Verify locations of existing utilities.
- D. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 3 times greater than diameter of rootball for trees. Depth of pit shall accommodate the root system. Remove excavated materials from the site, as indicated under Site Clearing Section.
- E. Provide pre-mixed planting mixture for use around the balls and roots of the plants consisting of topsoil and 1/2 lb. plant fertilizer as specified, for each cu. yd. of mixture.
- F. Provide pre-mixed ground cover bed planting mixture consisting of topsoil and 1/2 lb. Plant fertilizer as specified, per cu. yd. Provide beds a minimum of 8" deep. Excavate groundcover beds 4" deep, add planting mixture and fill to a depth of 8". If slopes are greater than 4 to 1 increase depth to 12".
- G. Palm trees with clear trunk greater than six (6) feet in height shall be backfilled with soil indigenous to site.

1.11 INSTALLATION:

- A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent

structure. Set plant material 2"-3" above the finish grade. No filling will be permitted around trunks of stems. Backfill the pit with planting mixture until approximately 2/3 full, then water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Do not use muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water. After balled and burlapped plants are set, place soil mixture around bases of balls and fill all voids.

1. Remove all burlap, ropes, and wires from the tops of balls.
- B. Space ground cover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 4' of the trunks of trees and shrubs within planting bed and to within 1' of edge of bed.
- C. Apply anti-desiccant using power spray to provide adequate film over trunks, branches, stems, twigs and foliage.
- D. Mulch:
1. Apply pre-emergent weed killer over grade prior to mulching, as specified by Landscape Architect. Use rates recommended for specified product.
 2. Mulch tree, shrub planting pits and shrub beds with required mulching material 3" deep or as otherwise noted immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.
- E. Staking/Guying:
1. Guy all trees over 2" in caliber immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may effect tree survival or appearance occur, the Landscape Architect may require immediate staking/guying.
 2. Brace all palm trees. Wrap with 5 layers burlap approximately 1/3 of the way up trunk. Attach lumber with cleats and hammer braces to lumber. Secure to ground with stake.
 3. All work shall be acceptable to the Landscape Architect.
- F. Pruning:
1. Prune branches of B&B stock, prior to transplanting, to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds, proportion shall in all cases be acceptable to the Landscape Architect. Remove or cut back broken, damaged, and unsymmetrical growth of new wood. Prune trees to retain required height and spread. Do not cut structural branches. Required sizes are the size after pruning.
 2. Multiple leader plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches at branch collars.
- G. Care of Existing Trees:
1. All existing trees, if any, shall be protected through the duration of this project as outlined in the Tree Protection Standards of the City of Tampa Site Clearing

Ordinance. These requirements and those attached at the end of this section are available in the City Hall Annex Building, Duplication office for a fee.

H. Tree And Landscape Relocation:

1. Tree and landscape relocation shall be performed under the supervision of the an HCAA representative. Materials to be stockpiled shall be maintained in a location and manner acceptable to the Owner. Temporary irrigation shall be provided. The Landscape Architect shall be notified 48-hours prior to moving existing plant material.

1.12 MAINTENANCE:

- A. Begin maintenance immediately after planting. Maintain all plant material until final acceptance and for an establishment period of ninety (90) days after final acceptance.
- B. Maintenance shall include but is not limited to pruning, cultivating, mowing, weeding, fertilizing, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.

1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

2. Tighten and repair guys and stakes as required.

- A. Correct defective work immediately after deficiencies become apparent and weather permits.

3. In addition to irrigation system or if no system exists, water trees every other day saturating the soil to depth of three (3) feet for the first two (2) weeks. If no irrigation system exists, water plant material per the following schedule:

1-30 days - water every other day, saturating the soil to a depth of 3 feet.

30-90 days - water twice a week, saturating the soil to a depth of three (3) feet.

90-365 days - water once a week, saturating the soil to a depth of three (3) feet.

Quantity of water applied should be adjusted in accordance to rainfall.

1.13 ACCEPTANCE:

- A. Inspection to determine acceptance of planted areas will be made by the Landscape Architect upon Contractor's request. Provide notification at least 5 working days before requested inspection date.

1. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition.

- B. The Landscape Architect will prepare a "punch list" of those items which must be corrected before reinspection for final acceptance. The Landscape Architect will determine an appropriate time period in which punchlist items must be corrected. Provide 48-hour notification of need for reinspection.
- C. The owner will assume plant maintenance 30 days after final acceptance, at which time, the contractor shall request a final maintenance inspection for acceptance, where requirements as stated in 3.5 apply.

1.14 WARRANTY:

- A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after completion and final acceptance of entire project.
- B. Replace, in accordance with the drawings and specifications, all plants that are dead or as determined by the Owner to be in an unhealthy or unsightly condition, and have lost their natural shape due to contractor's negligence. The cost of such replacement(s) is at Contractor's expense. Warrant all replacement plants for six months after final acceptance.
- C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing, rains, lightning storms or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area; acts of vandalism or negligence on the part of the owner.
- D. Remove and replace immediately all plants found to be dead or in unhealthy condition as determined by Owner at any time during warranty period. Make replacements within four (4) weeks of notification.
 - 1. An inspection will be conducted at the end of the warranty period. Contractor will replace any plants found to be dead or in poor condition at this time within four (4) weeks of inspection. Contractor will also remove any tree bracing or guying determined by the city representative to be unnecessary at this point in the trees development.

1.15 CLEANING:

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Coordinate with General Contractor on site storage of debris and/or trash. Repair damage resulting from planting operations.

END OF SECTION 329300