Solicitation 673-12019

Fire Station No.2 Heating, Ventilation & Air Conditioning Upgrades (12200 ReBid)

Bid Designation: Public

CITY OF FORT LAUDERDALE

City of Fort Lauderdale

Bid 673-12019
Fire Station No.2 Heating, Ventilation & Air Conditioning Upgrades (12200 ReBid)

Bid Number	673-12019
Bid Title	Fire Station No.2 Heating, Ventilation & Air Conditioning Upgrades (12200 ReBid)
Bid Start Date	Aug 14, 2017 4:44:50 PM EDT
Bid End Date	Oct 3, 2017 2:00:00 PM EDT
Question & Answer End Date	Sep 27, 2017 5:00:00 PM EDT
Bid Contact	Maureen Lewis, MBA Procurement Specialist II Finance 954-**828**-5239 maureenl@fortlauderdale.gov
Bid Contact	Althea Pemsel Asst. Procurement & Contracts Manager Finance 954-**828**-5139 apemsel@fortlauderdale.gov
Contract Duration	**One Time Purchase**
Contract Renewal	Not Applicable
Prices Good for	**120 days**
Pre-Bid Conference	**Aug 31, 2017 10:00:00 AM EDT** **Attendance is optional** **Location: Fire Station No. 2** **528 NW 2nd Street** **Fort Lauderdale, Florida 33311**
Bid Comments	**Sealed bids will be received electronically until 2:00 P.M., local time, on THURSDAY, SEPTEMBER 14, 2017, and opened immediately thereafter in the 5th Floor Conference Room, City Hall, 100 North Andrews Avenue, Fort Lauderdale, Florida, 33301, for BID NO., 673-12019, PROJECT NO., 12200 RE-BID, FIRE STATION NO. 2 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) UPGRADES.** **This Project consists of Drawing File No., 4-140-05, twenty-seven (27) sheets.** **This project is located at 528 NW 2nd St., in the City of Fort Lauderdale. The work includes, but is not limited to, partial demolition of the existing heating ventilation and air conditioning (HVAC) system, cleaning and sanitizing of the remaining ductwork. The new HVAC system also includes chillers, new air handler units (AHUs), new ceiling exhaust fans, and other items as indicated in the plans and specifications.** **NOTE: Payment on this contract will be made by Visa or MasterCard.** **Licensing Requirements: – Possession of a State of Florida General Contractor's License, and State of Florida Mechanical Contractor's License is required for this Project.**

Pre-Bid Meeting/Site visit: · A pre-bid meeting and site visit will be held on THURSDAY, AUGUST 31, 2017, at 10:00 a.m., local time, at Fire Station No. 2, 528 NW 2nd Street, Fort Lauderdale, Florida, 33311.

While attendance is not mandatory, it is strongly suggested that all Contractors attend the pre-proposal conference and site visit since tours at other times might not be available. It will be the sole responsibility of the bidder to inspect the City's location and become familiar with the scope of the City's requirements and systems prior to submitting a proposal. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a proposal will be considered evidence that the proposer has familiarized himself with the nature and extent of the work, equipment, materials, and labor required.

Bidding blanks may be obtained free of charge at BIDSYNC.COM. Drawing Plans are on file in the Public Works Department, City of Fort Lauderdale, at 100 North Andrews Avenue, 4th floor, (Monday through Friday, 8:00 am to 4:30 pm) at a NON-REFUNDABLE cost of $50.00 (including sales tax per set). Only cash or cashier's check made payable to the City of Fort Lauderdale is accepted.
It will be the sole responsibility of the bidder to ensure that his bid is submitted prior to the bid opening date and time listed. PAPER BID SUBMITTALS WILL NOT BE ACCEPTED. BIDS MUST BE SUBMITTED ELECTRONICALLY VIA BIDSYNC.COM

Bid Security: A certified check, cashier's check, bank officer's check or bid bond for FIVE percent (5%) of the bid amount, made payable to the City of Fort Lauderdale, Florida, shall accompany each proposal.

Bid Bonds:

Bidders can submit bid bonds for projects four different ways.

BidSync allows bidders to submit bid bonds electronically directly through their system using Surety 2000. For more information on this feature and to access it, contact BIDSYNC customer care department.

Bidders may upload their original executed bid bond on BIDSYNC to accompany their bids with the electronic proposal, and deliver the original, signed and sealed hard copy within five (5) business days, with the company name, bid number and title clearly indicated.

Bidders can hand deliver their bid bond in a sealed envelope to the Finance Department, Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, FL 33301-1016, before time of bid opening, with the company name, bid number and title clearly indicated on the envelope.

Bidders can mail their bid bond to the Finance Department/Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, FL 33301-1016, before time of bid opening, with the company name, bid number and title clearly indicated on the envelope.

Certified Checks, Cashier's Checks and Bank Drafts
These cannot be submitted via BIDSYNC, nor are their images allowed to be uploaded and submitted with your electronic bid. These forms of securities, as well as hard copy bid bonds, must be received on or before the Invitation to Bid (ITB) opening date and time, at the Finance Department, Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, FL 33301-1016, with the bid number and title clearly indicated on the envelope.

It is the bidder's sole responsibility to ensure that his bid bond or other bid security is received by the Procurement Services Division before time of bid opening. Failure to adhere to this requirement may be grounds to consider the bid as non-responsive.

The City of Fort Lauderdale reserves the right to waive any informality in any or all bids and to reject any or all bids.

For information concerning technical specifications, please utilize the question/answer feature provided by BIDSYNC at www.bidsync.com. Questions of a material nature must be received prior to the cut-off date specified in the solicitation. Material changes, if any, to the scope of services or bidding procedures, will only be transmitted by written addendum. (See addendum section of BIDSYNC Site). Contractors please note: No part of your bid can be submitted via FAX. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a bid will be considered evidence that the Contractor has familiarized himself with the nature and extent of the work, equipment, materials, and labor required. The entire bid response must be submitted in accordance with all specifications contained in this solicitation.

Information on bid results and projects currently out to bid can be obtained on the City's website – http://www.fortlauderdale.gov/departments/finance/procurement-services . For general inquiries, please call (954) 828-5933.
Added on Aug 23, 2017:
Question 3 response added.
Added on Aug 31, 2017:
Pre-Bid Meeting Attendance Sheet added.
Added on Sep 6, 2017:
Addendum 1) Bid date extended due Hurricane Irma.
Added on Sep 14, 2017:
Bid Opening date extended.
Second site visit scheduled.
Added on Sep 25, 2017:
Site Visit #2 Attendance Sheet added

Addendum # 1

New Documents	**P12200 Re-Bid.ADDENDUM 1.pdf**

Addendum # 2

New Documents	**P12200 Re-Bid.Pre-Bid Mtg. Attendance Sheet.pdf**

Addendum # 3

Previous End Date	Sep 14, 2017 2:00:00 PM EDT	New End Date	Sep 21, 2017 2:00:00 PM EDT

Addendum # 4

New Documents	**P12200 Re-Bid.ADDENDUM 4.pdf**		
Previous End Date	Sep 21, 2017 2:00:00 PM EDT	New End Date	Oct 3, 2017 2:00:00 PM EDT
Previous Q & A End Date	Sep 7, 2017 5:00:00 PM EDT	New Q & A End Date	Sep 27, 2017 5:00:00 PM EDT

Addendum # 5

New Documents	**12200 Re-bid.Site Visit 2 Attendance Sheet.9-20-17.pdf**

Item Response Form

Item	**673-12019--01-01 -** BASE BID: Mobilization and Demobilization
Lot Description	BASE BID
Quantity	**1 lump sum**
Unit Price	
Delivery Location	**City of Fort Lauderdale**

See ITB Specifications

See ITB Specifications
Fort Lauderdale FL 33301
Qty 1

Description
Mobilization includes securing and cordoning off of the work area and activation of contractors physical and manpower resources for transfer to a construction site as well as ensuring that all utilities are available for use during actual construction, including MOT approval and any other fees associated with metered parking closure during the renovations. THIS ITEM CANNOT EXCEED 5% OF THE BASE BID ITEM ONLY. (DOES NOT INCLUDE BID ALTERNATES OR ALLOWANCES).

Item **673-12019--01-02 -** BASE BID: Renovations
Lot Description BASE BID
Quantity **1 lump sum**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1

Description
Furnish all materials, labor, and equipment to perform all the work to be accomplished under this contract, which includes, but is not limited to, partial demolition of existing HVAC system, a new HVAC designed with two chillers, air handling units, ceiling exhaust fans, and all other items quantified as per drawings and schedules. The lump sum price shall include all labor, materials, equipment, and test and balance of the completely installed and operational system. Please refer to special working conditions Section 011200 of the Specifications. This base bid shall include insurance, bond, overhead and profit, and all other fixed costs.

Item **673-12019--02-01 -** BID ALTERNATE 1: Ductwork Cleaning and Sanitizing
Lot Description BID ALTERNATE 1
Quantity **1 lump sum**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1

Description
Furnish all materials, labor, and equipment to vacuum clean and sanitize the remaining ductwork. This cleaning should be done through duct openings. The duct opening should be no more than 10 feet from each other. This work shall be completed as per Section 230130 of the Specifications. This item should be priced as an alternate including insurance, bond, overhead and profit, and all other fixed costs.

Item **673-12019--03-01 -** BID ALTERNATE 2: IT room dedicated air conditioning unit
Lot Description BID ALTERNATE 2
Quantity **1 lump sum**
Unit Price
Delivery Location **City of Fort Lauderdale**
See ITB Specifications
See ITB Specifications
Fort Lauderdale FL 33301
Qty 1

Description

Furnish independent IT room air conditioning air handler (Unit Number 3-6), mounted above-the-ceiling in room adjacent to the 3rd floor IT room. See plans for location, connections, and specifications. The lump sum price shall include all labor, materials, equipment, and test and balance of the complete system. This item should be priced as an alternate including insurance, bond, overhead and profit, and all other fixed costs.

CITY OF FORT LAUDERDALE
CONTRACT AND SPECIFICATIONS PACKAGE

BID NO. 673-12019

PROJECT NO. 12200 RE-BID

FIRE STATION NO. 2 HEATING, VENTILATION, AND AIR CONDITIONING(HVAC)UPGRADES

Issued on Behalf of: The Public Works Department
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

ALEX RIO
PROJECT MANAGER 1

IRINA TOKAR, RA, NCARB, LEED AP
SENIOR PROJECT MANAGER

MAUREEN LEWIS, MBA
PROCUREMENT SPECIALIST II
Telephone: (954) 828-5239 E-mail: maureenl@fortlauderdale.gov

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Description **Pages**

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Note: The following documents are available electronically for completion and must be returned with your bid along with your bid security, proof of insurance, and proof of required licenses/certifications.

INVITATION TO BID

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INVITATION TO BID (continued)

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Information on bid results and projects currently out to bid can be obtained on the City's website – http://www.fortlauderdale.gov/departments/finance/procurement-services. For general inquiries, please call (954) 828-5933.

INSTRUCTIONS TO BIDDERS

The following instructions are given for the purpose of guiding bidders in properly preparing their bids or proposals. These directions have equal force and weight with the specifications and strict compliance is required with all of these provisions.

QUALIFICATIONS OF BIDDERS – No proposal will be accepted from, nor will any contract be awarded to, any person who is in arrears to the CITY OF FORT LAUDERDALE, upon any debt or contract, or who has defaulted, as surety or otherwise, upon any obligation to the City, or who is deemed irresponsible or unreliable by the City Commission of Fort Lauderdale.

PERSONAL INVESTIGATION - Bidders shall satisfy themselves by personal investigation, and by such other means as they may think necessary or desirable, as to the conditions affecting the proposed work and the cost. No information derived from maps, plans, specifications, or from the Engineer, City Manager, or their assistants shall relieve the Contractor from any risk or from fulfilling all terms of the contract.

INCONSISTENCIES – Any seeming inconsistency between different provisions of the plans, specifications, proposal or contract, or any point requiring explanation must be inquired into by the bidder, in writing, at least ten (10) days prior to the time set for opening proposals. After proposals are opened, the bidders shall abide by the decision of the Engineer as to such interpretation.

ADDENDA AND INTERPRETATIONS - No interpretations of the meaning of the plans, specifications or other contract documents will be made orally to any bidder. Prospective bidders must request such interpretation in writing as instructed in the bid package. To be considered, such request must be received by the Questions and Answers deadline as indicated in BIDSYNC.COM. Material changes, if any, to the scope of services or bidding procedures will only be transmitted by written addendum. **It is the bidder's responsibility to verify if addendums have been issued in BIDSYNC.COM.** Failure of any bidder to receive any such addenda or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become a part of the contract document. **Bidder** shall verify **in BIDSYNC.COM** that he has all addenda before submitting a bid.

LEGAL CONDITIONS - Bidders are notified to familiarize themselves with the provisions of the laws of the State of Florida relating to hours of labor on municipal work, and with the provisions of the laws of the State of Florida and the Charter and the ordinances of the City of Fort Lauderdale.

PUBLIC ENTITY CRIMES - 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, Florida Statutes, for CATEGORY TWO for a period of thirty-six (36) months from the date of being placed on the convicted vendor list.

FORMS OF PROPOSALS - Each proposal and its accompanying statements must be made on the blanks provided. THE FORMS MUST BE SUBMITTED ELECTRONICALLY, IN GOOD ORDER WITH ALL BLANKS COMPLETED, and must show the name of the bidder and a statement as to its contents.

INSTRUCTIONS TO BIDDERS (continued)

FORMS OF PROPOSALS (CONTINUED) - The proposal must be signed by one duly authorized to do so, and in case signed by a deputy or subordinate, the principal's properly written authority to such deputy or subordinate must accompany the proposal. No proposal will be accepted, for any reason whatsoever, which is not submitted to the City as stated above, within the specified time.

INSURANCE - Contractor shall provide and shall require all of its sub-contractors to provide, pay for, and maintain in force at all times during the term of the Agreement, such insurance, including Property Insurance (Builder's Risk), Commercial General Liability Insurance, Business Automobile Liability Insurance, Workers' Compensation Insurance, Employer's Liability Insurance, and Umbrella/Excess Liability, as stated below. Such policy or policies shall be issued by companies authorized to do business in the State of Florida and having agents upon whom service of process may be made in the State of Florida.

BID BOND - A certified check, cashier's check or bank officer's check, for the sum set forth in the advertisement, made payable to the City of Fort Lauderdale, Florida, or bid bond in such amount, shall accompany each proposal as evidence of the good faith and responsibility of the bidder. The check or bond shall be retained by the City as liquidated damages should the bidder refuse to or fail to enter into a contract for the execution of the work embraced in this proposal, in the event the proposal of the bidder is accepted. Retention of such amount shall not be construed as a penalty or forfeiture.

The above bond or check shall be a guarantee that the bidder will, if necessary, promptly execute a satisfactory contract and furnish good and sufficient bonds. As soon as a satisfactory contract has been executed and the bonds furnished and accepted, the check or bond accompanying the proposal of the successful bidder will be returned to him. The certified or other checks or bid bonds of the unsuccessful bidders will be returned to them upon the acceptance of the bid of the successful bidder. If the successful bidder shall not enter into, execute, and deliver such a contract and furnish the required bonds within ten (10) days after receiving notice to do so, the certified or other check or bid bond shall immediately become the property of the City of Fort Lauderdale as liquidated damages. Retention of such amount shall not be construed as a penalty or forfeiture.

FILLING IN BIDS - All prices must be electronically submitted in the proposal pages, and all proposals must fully cover all items for which proposals are asked and no other. Bidders are required to state the names and places of residence of all persons interested, and if no other person is interested, the bidder shall distinctly state such fact and shall state that the proposal is, in all respects, fair and without collusion or fraud. Where more than one person is interested, it is required that all persons interested or their legal representative make all verification and subscribe to the proposal.

PRICES QUOTED: Deduct any discount offered and quote firm net unit prices. In the case of a discrepancy in computing the amount of the bid, the unit price quoted will govern. All prices quoted shall be F.O.B. destination, freight prepaid (Bidder pays and bears freight charges, Bidder owns goods in transit and files any claims), unless otherwise stated in Special Conditions. Each item must be bid separately. No attempt shall be made to tie any item or items contained in the ITB with any other business with the City.

BIDS FIRM FOR ACCEPTANCE: Bidder warrants, by virtue of bidding, that his bid and the prices quoted in his bid will be firm for acceptance by the City for a period of one hundred and twenty (120) days from the date of bid opening unless otherwise stated in the ITB. The City shall award contract within this time period or shall request to the recommended awarded vendor an extension to hold pricing, until products/services have been awarded.

ADDITIONAL ITEMS OR SERVICES: The City may require additional items or services of a similar nature, but not specifically listed in the contract. The Contractor agrees to provide such items or

INSTRUCTIONS TO BIDDERS (continued)

services, and shall provide the City prices on such additional items or services. If the price(s) offered are not acceptable to the City, and the situation cannot be resolved to the satisfaction of the City, the City reserves the right to procure those items or services from other vendors, or to cancel the contract upon giving the Contractor thirty (30) days written notice.

DELETION OR MODIFICATION OF SERVICES: The City reserves the right to delete any portion of the Contract at any time without cause, and if such right is exercised by the City, the total fee shall be reduced in the same ratio as the estimated cost of the work deleted bears to the estimated cost of the work originally planned. If work has already been accomplished on the portion of the Contract to be deleted, the Contractor shall be paid for the deleted portion on the basis of the estimated percentage of completion of such portion.

If the Contractor and the City agree on modifications or revisions to the task elements, after the City has approved work to begin on a particular task or project, and a budget has been established for that task or project, the Contractor will submit a revised budget to the City for approval prior to proceeding with the work.

CAUSES FOR REJECTION - No proposal will be canvassed, considered or accepted which, in the opinion of the City Commission, is informal or unbalanced, or contains inadequate or unreasonable prices for any items; each item must carry its own proportion of the cost as nearly as is practicable. Any alteration, erasure, interlineation, or failure to specify bids for all items called for in the schedule shall render the proposal informal.

REJECTION OF BIDS - The City reserves the right to reject any bid if the evidence submitted by the bidder, or if the investigation of such bidder, fails to satisfy the City that such bidder is properly qualified to carry out the obligations and to complete the work contemplated. Any or all proposals will be rejected, if there is reason to believe that collusion exists among bidders. A proposal will be considered irregular and may be rejected, if it shows 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.

BID PROTEST PROCEDURE: Any proposer or bidder who is not recommended for award of a contract and who alleges a failure by the City to follow the City's procurement ordinance or any applicable law may protest to the Procurement Division – Deputy Director of Finance, by delivering a letter of protest within five (5) days after a Notice of Intent to award is posted on the City's website at the following link: http://www.fortlauderdale.gov/purchasing/notices_of_intent.htm. The complete protest ordinance may be found on the City's website at the following link: http://www.fortlauderdale.gov/purchasing/protestordinance.pdf

WITHDRAWALS - Any bidder may, without prejudice to himself, withdraw his proposal at any time prior to the expiration of the time during which proposals may be submitted. Such request for withdrawal must be in writing and signed in the same manner and by the same person who signed the proposal. After expiration of the period for receiving proposals, no proposal can be withdrawn, modified, or explained.

CONTRACT - The bidder to whom award is made shall execute a written contract to do the work and maintain the same in good repair until final acceptance by the proper authorities, and shall furnish good and sufficient bonds as specified within ten (10) days after receiving such contract for execution. If the bidder to whom the first award is made fails to enter into a contract as provided, the award may be annulled and the contract let to the next lowest bidder who is reliable, responsible, and responsive in the opinion of the City Commission, and that bidder shall fulfill every stipulation and obligation as if such bidder were the original party to whom award was made.

INSTRUCTIONS TO BIDDERS (continued)

The contract shall provide that the Contractor agrees to correct any defective or faulty work or material, which may appear within one (1) year after completion of the work and receipt of final payment.

ENFORCEMENT OF SPECIFICATIONS - Copies of the specifications will be placed in the hands of all the assistants to the Engineer and Inspectors employed on the work, who shall enforce each and every requirement of the contract. Such assistants shall have no authority to vary from such requirements.

COPIES OF DRAWING PLANS - Copies of the drawing plans are on file in the Public Works Department, City Hall, 4th Floor, 100 N. Andrews Avenue, Fort Lauderdale, Florida 33301.

SURETY BOND – The Contractor shall execute and record in the public records of Broward County, Florida, a payment and performance bond in an amount at least equal to the Contract Price with a surety insurer authorized to do business in the State of Florida as surety, ("Bond"), in accordance with Section 255.05, Florida Statutes (2014), as may be amended or revised, as security for the faithful performance and payment of all of the Contractor's obligations under the Contract Documents.

The successful bidder shall furnish a performance and payment bond in compliance with Section 255.05, Florida Statutes, written by a Corporate Surety company, holding a Certificate of Authority from the Secretary of the Treasury of the United States as acceptable sureties on federal bonds, in an amount equal to the total amount payable by the terms of the contract, executed and issued by a Resident Agent licensed by and having an office in the State of Florida, representing such Corporate Surety, conditioned for the due and faithful performance of the work, and providing in addition to all other conditions, that if the Contractor, or his or its subcontractors, fail to duly pay for any labor, materials, or other supplies used or consumed by such Contractor, or his or its subcontractor or subcontractors, in performance of the work contracted to be done, the Surety will pay the same in the amount not exceeding the sum provided in such bonds, together with interest at the rate of fifteen percent (15%) per annum, and that they shall indemnify and save harmless the City of Fort Lauderdale to the extent of any and all payments in connection with carrying out of the contract, which the City may be required to make under the law.

The Contractor is required at all times to have a valid surety bond in force covering the work being performed. A failure to have such bond in force at any time shall constitute a default on the part of the Contractor. A bond written by a surety, which becomes disqualified to do business in the State of Florida, shall automatically constitute a failure on the part of the Contractor to meet the above requirements.

Such bond shall continue in effect for one (1) year after completion and acceptance of the work with liability equal to at least twenty-five percent (25%) of contract price, or an additional bond shall be conditioned that the Contractor will correct any defective or faulty work or material which appear within one (1) year after completion of the contract, upon notification by the City, except in contracts which are concerned solely with demolition work, in which cases twenty-five percent (25%) liability will not be applicable.

AUDIT OF CONTRACTOR'S RECORDS - Upon execution of the Contract, the City reserves the right to conduct any necessary audit of the Contractor's records. Such an audit, or audits, may be conducted by the City or its representatives at any time prior to final payment, or thereafter, for a period up to three (3) years. The City may also require submittal of the records from either the Contractor, the Subcontractor, or both. For the purpose of this Section, records shall include all books of account, supporting documents and papers deemed necessary by the City to assure compliance with the contract provisions.

INSTRUCTIONS TO BIDDERS (continued)

Failure of the Contractor or Subcontractor to comply with these requirements may result in disqualification or suspension from bidding for future contracts or disapproval as a Subcontractor at the option of the City.

The Contractor shall assure that each of its Subcontractors will provide access to its records pertaining to the project upon request by the City.

PERIODIC ESTIMATE FOR PARTIAL PAYMENT - After the Contractor has submitted a periodic estimate for partial payment, approved and certified by the Public Works Department, the City shall make payment in the manner provided in the Contract Documents and in accordance with Florida's Prompt Payment Act, Section 218, Florida Statutes.

RESERVATION FOR AWARD AND REJECTION OF BIDS - The City reserves the right to accept or reject any or all bids, part of bids, and to waive minor irregularities or variations to specifications contained in bids, and minor irregularities in the bidding process. The City also reserves the right to award the contract on a split order basis, lump sum basis, individual item basis, or such combination as shall best serve the interest of the City. The City reserves the right to make an award to the responsive and responsible bidder whose product or service meets the terms, conditions, and specifications of the ITB and whose bid is considered to best serve the City's interest. In determining the responsiveness of the offer and the responsibility of the Bidder, the following shall be considered when applicable: the ability, capacity and skill of the Bidder to perform as required; whether the Bidder can perform promptly, or within the time specified, without delay or interference; the character, integrity, reputation, judgment, experience and efficiency of the Bidder; the quality of past performance by the Bidder; the previous and existing compliance by the Bidder with related laws and ordinances; the sufficiency of the Bidder's financial resources; the availability, quality and adaptability of the Bidder's supplies or services to the required use; the ability of the Bidder to provide future maintenance, service or parts; the number and scope of conditions attached to the bid.

MINORITY AND WOMEN BUSINESS ENTERPRISE PARTICIPATION AND BUSINESS - It is the desire of the City of Fort Lauderdale to increase the participation of minority (MBE) and women-owned (WBE) businesses in its contracting and procurement programs. While the City does not have any preference or set aside programs in place, it is committed **to a policy of equitable participation for these firms.** The City of Fort Lauderdale wants to increase the participation of Minority Business Enterprises (MBE), Women Business Enterprises (WBE), and Small Business Enterprises (SBE) in its procurement activities. If your firm qualifies in accordance with the below definitions please indicate in the space provided in this ITB.

Minority Business Enterprise (MBE) "A Minority Business" is a business enterprise that is owned or controlled by one or more socially or economically disadvantaged persons. Such disadvantage may arise from cultural, racial, chronic economic circumstances or background or other similar cause. Such persons include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

The term "Minority Business Enterprise" means a business at least fifty-one percent (51%) of which is owned by minority group members or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by minority group members. For the purpose of the preceding sentence, minority group members are citizens of the United States who include, but are not limited to: Blacks, Hispanics, Asian Americans, and Native Americans.

INSTRUCTIONS TO BIDDERS (continued)

Women Business Enterprise (WBE) a "Women Owned or Controlled Business" is a business enterprise at least fifty-one percent (51%) of which is owned by females or, in the case of a publicly owned business, at least fifty-one percent (51%) of the stock of which is owned by females.

Small Business Enterprise (SBE) "Small Business" means a corporation, partnership, sole proprietorship, or other legal entity formed for the purpose of making a profit, which is independently owned and operated, has either fewer than 100 employees or less than $1,000,000 in annual gross receipts.

BLACK includes persons having origins in any of the Black racial groups of Africa.

WHITE includes persons whose origins are Anglo-Saxon and Europeans and persons of Indo-European decent including Pakistani and East Indian.

HISPANIC includes persons of Mexican, Puerto Rican, Cuban, Central and South American, or other Spanish culture or origin, regardless of race.

NATIVE AMERICAN includes persons whose origins are American Indians, Eskimos, Aleuts, or Native Hawaiians.

ASIAN AMERICAN includes persons having origin in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.

DEBARRED OR SUSPENDED BIDDERS OR PROPOSERS - The bidder or proposer certifies, by submission of a response to this solicitation, that neither it nor its principals and subcontractors are presently debarred or suspended by any Federal department or agency.

LOBBYING ACTIVITIES - **ALL CONTRACTORS PLEASE NOTE**: Any contractor submitting a response to this solicitation must comply, if applicable, with City of Fort Lauderdale Ordinance No. C-00-27 & Resolution No. 07-101, Lobbying Activities. Copies of Ordinance No., C-00-27, and Resolution No. 07-101, may be obtained from the City Clerk's Office on the 7th Floor of City Hall, 100 N. Andrews Avenue, Fort Lauderdale, Florida 33301. The ordinance may also be viewed on the City's website at http://www.fortlauderdale.gov/clerk/LobbyistDocs/lobbyist_ordinance.pdf.

SPECIAL CONDITIONS

01. PURPOSE

The City of Fort Lauderdale, Florida (City) is seeking bids from qualified bidders, hereinafter referred to as the Contractor, to provide Heating, Ventilation and Air Conditioning (HVAC) upgrades for Fire Station No. 2, in accordance with the terms, conditions, and specifications contained in this Invitation To Bid (ITB).

02. TRANSACTION FEES

The City of Fort Lauderdale uses BidSync (www.bidsync.com) to distribute and receive bids and proposals. There is no charge to vendors/contractors to register and participate in the solicitation process, nor will any fees be charged to the awarded contractor.

03. SUBMISSION OF BIDS

It is the sole responsibility of the Contractor to ensure that their bid is submitted electronically through BidSync at www.bidsync.com and that any bid security not submitted via BidSync reaches the City of Fort Lauderdale City Hall, Procurement Services Division, 6th floor, Room 619, 100 N. Andrews Avenue, Fort Lauderdale, FL 33301 in a sealed envelope marked on the outside with the ITB solicitation number and Contractor's name, no later than the time and date specified in this solicitation. **PAPER BID SUBMITALS WILL NOT BE ACCEPTED. PLEASE SUBMIT YOUR BID RESPONSE ELECTRONICALLY.**

04. INFORMATION OR CLARIFICATION

For information concerning procedures for responding to this solicitation, contact **Maureen Lewis**, **Procurement Specialist II**, at (954) 828-5239 or email at maureenl@fortlauderdale.gov. Such contact shall be for clarification purposes only.

For information concerning technical specifications please utilize the question/answer feature provided by BidSync at www.bidsync.com. Questions of a material nature must be received prior to the cut-off date specified in the solicitation. Material changes, if any, to the scope of services or bidding procedures will only be transmitted by written addendum. (See addendum section of BidSync Site). **Contractors please note**: No part of your bid can be submitted via FAX. No variation in price or conditions shall be permitted based upon a claim of ignorance. Submission of a bid will be considered evidence that the Contractor has familiarized himself with the nature and extent of the work, and the equipment, materials, and labor required. The entire bid response must be

submitted in accordance with all specifications contained in this solicitation. The questions and answers submitted in BidSync shall become part of any contract that is created from this ITB.

05. CONTRACT TIME

5.1 The Contractor recognizes that TIME IS OF THE ESSENCE. The Work shall commence within **10** calendar days of the date of the Notice to Proceed.

5.2 The Work shall be Substantially Completed within **120** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

5.3 The Work shall be finally completed on the Final Completion Date and ready for final payment in accordance with this Agreement within **150** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

The City of Fort Lauderdale reserves the right to waive any informality in any bid and to reject any or all bids. The City of Fort Lauderdale reserves the right to reduce or delete any of the bid items.

At time of award of contract, the City reserves the right to set a maximum dollar limit that may be expended on this project. Contract quantities of any or all items may be increased, reduced, or eliminated to adjust the contract amount to coincide with the amount of work necessary or to bring the contract value to within the established limit. All quantities are estimated and the City reserves the right to increase, reduce, or eliminate the contract quantities in any amount.

The undersigned bidder affirms that he has or will obtain all equipment necessary to complete the work described, that he has or will obtain all required permits and licenses from the appropriate agencies, and that his firm is authorized to do business in the State of Florida.

06. BID SECURITY

A certified check, cashier's check, bank officer's check or bid bond for **FIVE** percent **(5%)** of the bid amount, made payable to the City of Fort Lauderdale, Florida, shall accompany each proposal.

07. REQUIRED LICENSES/CERTIFICATIONS

Contractor must possess the following licenses/certifications to be considered for award.

State of Florida General Contractor's License, and/or State of Florida Mechanical Contractor's License.

Note: Contractor must have proper licensing and be able to provide evidence of same, if requested, at time of award.

08. SPECIFIC EXPERIENCE REQUIRED

The following expertise is required to be considered for this contract. Specific references attesting to this expertise must be submitted with bid.

The contractor shall have previous in installation of chilled water cooled Air Handling units, specifically with water modulating control system. Contractor shall have a minimum of three (3) years' experience working on projects of similar type and size. Bidder shall submit proof of said experience and shall, for each project listed, identify location; dates of construction; project name and overall scope; scope of work that was self-performed by Contractor; and client's name, address, telephone number and e-mail address.

NOTE: REFERENCES SHOULD NOT INCLUDE CITY OF FORT LAUDERDALE EMPLOYEES OR WORK PERFORMED FOR THE CITY. THE CITY IS INTERESTED IN WORK EXPERIENCE AND REFERENCES FROM ENTITIES OTHER THAN THE CITY OF FORT LAUDERDALE.

By signing this bid solicitation, contractor is affirming that this expertise will be provided for this contract at no additional charge.

09. BID ALLOWANCE

Allowance for permits: Payments will be made to the contractor based on the actual cost of permits upon submission of paid permit receipts. The City shall not pay for other costs related to obtaining or securing permits.

The amount indicated is intended to be sufficient to cover the entire project. If the City Permit fees exceed the allowance indicated, the City will reimburse the contractor the actual amount of City Permit Fees required for project completion.

Allowance	$
Additional equipment rental allowance	2,000
Additional labor allowance	20,000
Additional material allowance	20,000
Permit fee allowance	8,000
Testing allowance	2,000
Temporary Cooling Allowance	15,000
TOTAL	**$67,000**

Note: The City will add this allowance to your bid.

10. INSURANCE REQUIREMENTS *(See Article 10, Bonds and Insurance, of the Contract for details)*

10.1 General Information

Contractor shall provide and shall require all of its sub-contractors to provide, pay for, and maintain in force at all times during the term of the Agreement, such insurance, including Property Insurance (Builder's Risk), Commercial General Liability Insurance, Business Automobile Liability Insurance, Workers' Compensation Insurance, Employer's Liability Insurance, and Umbrella/Excess Liability, as stated below, as well as Professional Liability insurance in the amount of $1,000,000 for any Architectural and/or Engineering requirements associated with the fulfillment of the contract if required. Such policy or policies shall be issued by companies authorized to do business in the State of Florida and having agents upon whom service of process may be made in the State of Florida. **A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the insurance companies' names for all required coverage, and the dollar amounts of the coverage.**

a) The City is required to be named as additional insured on the Commercial General Liability insurance policy. BINDERS ARE UNACCEPTABLE. The insurance coverage required shall include those classifications, as listed in standard liability insurance manuals, which most nearly reflect the operations of the Contractor. Any exclusions or provisions in the insurance maintained by the Contractor that precludes coverage for the work contemplated in this Agreement shall be deemed unacceptable, and shall be considered a breach of contract.

b) The Contractor shall provide the City an original Certificate of Insurance for policies required by Article 10. All certificates shall state that the City shall be given ten (10) days' notice prior to expiration or cancellation of the policy. The insurance provided shall be endorsed or amended to comply with this notice requirement. In the event that the insurer is unable to accommodate, it shall be the responsibility of the Contractor to provide the proper notice. Such notification will be in writing by registered mail, return receipt requested and addressed to the Finance Department. Such policies shall: (1) name the insurance company or companies affording coverage acceptable to the City, (2) state the effective and expiration dates of the policies, (3) include special endorsements where necessary. Such policies provided under Article 10 shall not be affected by any other policy of insurance, which the City may carry in its own name.

c) Contractor shall, as a condition precedent of this Agreement, furnish to the City of Fort Lauderdale, c/o Project Manager, 100 N. Andrews Avenue, Fort Lauderdale, FL 33301, Certificate(s) of Insurance upon execution of this Agreement, which indicate that insurance coverage has been obtained which meets the requirements as outlined below:

10.2 Property Insurance (Builder's Risk): **- N/A**

10.3 Commercial General Liability:

a) Limits of Liability:

Bodily Injury and Property Damage - Combined Single Limit	
Each Occurrence	$1,000,000
Project Aggregate	$1,000,000
General Aggregate	$2,000,000
Personal Injury	$1,000,000
Products/Completed Operations	$1,000,000

b) Endorsements Required:

City of Fort Lauderdale included as an Additional Insured
Broad Form Contractual Liability
Waiver of Subrogation
Premises/Operations
Products/Completed Operations
Independent Contractors
Owners and Contractors Protective Liability
Contractor's Pollution Liability – **N/A**

10.4 Business Automobile Liability

a) Limits of Liability:

Bodily Injury and Property Damage - Combined Single Limit All Autos used in completing the contract Including Hired, Borrowed or Non-Owned Autos	
Any One Accident	$1,000,000

b) Endorsements Required:

Waiver of Subrogation

10.5 Workers' Compensation and Employer's Liability Insurance

Limits:

Workers' Compensation – Per Florida Statute 440
Employers' Liability - $500,000

Any firm performing work on behalf of the City of Fort Lauderdale must provide Workers' Compensation insurance. Exceptions and exemptions can only be made if they are in accordance with Florida Law.

Contractor must be in compliance with all applicable State and Federal workers' compensation laws, including the U.S. Longshore Harbor Workers' Act or Jones Act.

10.6 Umbrella/Excess Liability: The Contractor shall provide umbrella/excess coverage with limits of no less than $2,000,000 excess of Commercial General Liability, Automobile Liability and Employer's Liability.

10.7 Crane/On-Hook: The Contractor will need to provide documentation of his Crane/On-Hook coverage in the amount of $1,000,000, if any cranes are used during the course of the Project. Additionally, the Contractor will need to provide documentation of his subcontractors Crane/On-Hook coverage in the amount of $1,000,000 if any of his subcontractors utilize any cranes during the course of this Project.

10.8 All insurance policies required above shall be issued by companies authorized to do business under the laws of the State of Florida, with the following qualifications:

The Contractor's insurance must be provided by an A.M. Best's "A-" rated or better insurance company authorized to issue insurance policies in the State of Florida, subject to approval by the City's Risk Manager. Any exclusions or provisions in the insurance maintained by the Contractor that precludes coverage for work contemplated in this project shall be deemed unacceptable, and shall be considered breach of contract.

NOTE: CITY PROJECT NUMBER AND NAME MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORTLAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED".

A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the insurance companies' names for all required coverage, and the dollar amounts of the coverage.

Compliance with the foregoing requirements shall not relieve the Contractor of their liability and obligation under this section or under any other section of this Agreement.

The Contractor shall be responsible for assuring that the insurance certificates required in conjunction with this Section remain in force for the duration of the Project. If insurance certificates are scheduled to expire during the contractual period, the Contractor shall be responsible for submitting new or renewed insurance certificates to the City at a minimum of thirty (30) calendar days in advance of such expiration. In the event that expired certificates are not replaced with new or renewed certificates that cover the contractual period, the City shall:

a) Suspend the Agreement until such time as the new or renewed certificates are received by the City.

b) The City may, at its sole discretion, terminate the Agreement for cause and seek damages from the Contractor in conjunction with the violation of the terms and conditions of the Agreement.

11. PERFORMANCE AND PAYMENT BOND: 100%

Number of awards anticipated: 1

12. CITY PROJECT MANAGER

The Project Manager is hereby designated by the City as **Alex Rio, Project Manager I,** whose address is **100 North Andrews, 5th Floor, Fort Lauderdale, FL 33301, telephone number: (954) 828-5389, and e-mail address is ario@fortlauderdale.gov.** The Project Manager will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the Contract Documents in connection with completion of the Work in accordance with this Agreement.

13. LIQUIDATED DAMAGES *(See Article 16, Liquidated Damages, of the Contract for details)*

Upon failure of the Contractor to complete the Work within the time specified for completion, the Contractor shall pay to the City the sum of **Two Hundred and Fifty Dollars ($250.00)** for each and every calendar day that the completion of the Work is delayed beyond the time specified in this Agreement for completion, as fixed and agreed liquidated damages and not as a penalty, so long as the delay is caused by the Contractor. (See Article 16, Liquidated Damages Clause, of the Contract)

14. PAYMENT (*See Article 7, Payment, of the Contract for other details*)

The City has implemented a Purchasing Card (P-Card) Program utilizing both VISA and MASTERCARD networks. Purchases from this contract will be made utilizing the City's Purchasing Card. Contractor will receive payment from the purchasing card in the same manner as other credit card purchases. Accordingly, bidders must presently have the ability to accept these credit cards or take whatever steps necessary to implement the ability before the start of the contract term, or contract award by the City. The City reserves the right to revise this program as necessary.

15. WORK SCHEDULE (including overtime hours):

Work during evenings and weekends might be required since the project is an active fire station. Contractor shall plan on some work to be performed during non-business hours if needed.

Any inspection requested by the contractor outside those hours will be considered overtime to be paid by the Contractor.

16. INSPECTION OVERTIME COST: N/A

CITY OF FORT LAUDERDALE
CONSTRUCTION AGREEMENT

THIS AGREEMENT made and entered into this _____ day of _____, 20__, by and between the City of Fort Lauderdale, a Florida municipal corporation (City) and _____, (Contractor), (parties);

WHEREAS, the City desires to retain a contractor for the Project as expressed in its Invitation to Bid No., _____, Project Number, _____, which was opened on _____; and,

WHEREAS, the Contractor has expressed its willingness and capability to perform the necessary work to accomplish the Project.

NOW, THEREFORE, the City and the Contractor, in consideration of the mutual covenants and conditions contained herein and for other good and valuable consideration, the receipt and sufficiency is hereby acknowledged, agree as follows:

ARTICLE 1 – DEFINITIONS

Whenever used in this Agreement or in other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural forms:

1.1 Agreement – This written Agreement between the City and the Contractor covering the work to be performed including other Contract Documents that are attached to or incorporated in the Agreement.

1.2 Application for Payment – The form accepted by the City which is to be used by the Contractor in requesting progress or final payment and which is to include such supporting documentation as is required by the Contract Documents.

1.3 Approve – The word approve is defined to mean review of the material, equipment or methods for general compliance with design concepts and with the information given in the Contract Documents. It does not imply a responsibility on the part of the City to verify in every detail conformance with plans and specifications.

1.4 Bid – The offer or Bid of the Contractor submitted on the prescribed form setting forth the total prices for the Work to be performed.

1.5 Bid Documents –This Agreement, advertisement for Invitation to Bids, the Instructions to Bidders, the Bid Form (with supplemental affidavits and agreements), the Contract Forms, General Conditions, the Supplementary Conditions, the Specifications, and the Plans, which documents all become an integral part of the Contract Documents.

1.6 Certificate of Substantial Completion - Certificate provided by the City certifying that all Work, excluding the punch list items, has been completed, inspected, and accepted by the City.

1.7 Change Order - A change order is defined as a written order to a contractor approved by the City, authorizing a revision of an underlying agreement between the City and a contractor that is directly related to the original scope of work or an adjustment in the original contract price or the contract time directly related to the original scope of work, issued on or after the effective date of the contract.

1.8 City – The City of Fort Lauderdale, Florida, including but not limited to its employees, agents, officials, representatives, contractors, subcontractors, volunteers, successors and assigns, with whom the Contractor has entered into the Agreement and for whom the Work is to be provided.

1.9 Contract Documents – The Contract Documents shall consist of this Agreement, Exhibits to this Agreement, Public Construction Bond, Performance Bond, Payment Bond and Certificates of Insurance, Notice of Award and Notice to Proceed, General Conditions as amended by the Special Conditions, Technical Specifications, Plans/Drawings, Addenda, Bid Form and supplement Affidavits and Agreements, all applicable provisions of State and Federal Law and any modification, including Change Orders or written amendments duly delivered after execution of Agreement, Invitation to Bid, Instructions to Bidders and Bid Bond, Contractor's response to the City's Invitation to Bid, Schedule of Completion, Schedule of Values, all amendments, modifications and supplements, change orders and work directive changes issued on or after the Effective Date of the Agreement, as well as any additional documents that are required to be submitted under the Agreement.

Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Agreement. A copy of all permits shall be given to the City for inclusion in the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

1.10 Contract Price – The monies payable to the Contractor by the City under the Contract Documents and in accordance with the line item unit prices listed in the Bid.

1.11 Contract Time – The number of calendar days stated in the Agreement for the completion of the Work. The dates on which the work shall be started and shall be completed as stated in the Notice to Proceed.

1.12 Contractor – The person, firm, company, or corporation with whom the City has entered into the Agreement, including but not limited to its employees, agents, representatives, contractors, subcontractors, their subcontractors and their other successors and assigns.

1.13 Day – A calendar day of twenty-four (24) hours ending at midnight.

1.14 Defective – An adjective which when modifying the word "Work" refers to work that is unsatisfactory, faulty, or deficient, or does not conform to the Contract Documents or does not meet the requirements of any inspection, test or approval referred to in the Contract Documents, or has been damaged prior to the Project Manager's recommendation of final payment.

1.15 Effective Date of the Agreement – The effective date of the agreement shall be the date the City Commission approves the work. The contractor shall provide all required payment and performance bonds and insurances to the City within ten (10) calendar days following the City Commission approval. Upon verification of all bonds and insurances, the City will issue a notice to proceed (NTP) to the Contractor. Contract time will commence on the date when the Notice to Proceed is issued. The Contractor shall commence the work immediately upon receipt of the Notice to Proceed. Failure of the contractor to proceed with the work will constitute non-performance of the Contractor and would be ground for termination of the contract per ARTICLE 17 of the Agreement.

1.16 Final Completion Date – The date the Work is completed, including completion of the final punch list, and delivered along with those items specified in the Contract Documents and is accepted by the City.

1.17 Hazardous Materials (HAZMAT) - Any solid, liquid, or gaseous material that is toxic, flammable, radioactive, corrosive, chemically reactive, or unstable upon prolonged storage in quantities that could pose a threat to life, property, or the environment defined in Section 101(14) of Comprehensive Environmental Response, Compensation and Liability Act of 1980 and in 40 CFR 300.6. Also defined by 49 CFR 171.8 as a substance or material designated by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated.

1.18 Hazardous Substance - As defined by Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act; any substance designated pursuant to Section 311(b) (2) (A) of the Clean Water Act; any element, compound, mixture, solution or substance designated pursuant to Section 102 identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act {but not including any waste listed under Section 307[a] of the Clean Water Act}; any hazardous air pollutant listed under Section 112 of the Clean Air Act; and any imminently hazardous chemical substance or mixture pursuant to Section 7 of the Toxic Substances Control Act. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance in the first sentence of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

1.19 Hazardous Waste - Those solid wastes designated by OSHA in accordance with 40 CFR 261 due to the properties of ignitability, corrosivity, reactivity, or toxicity. Any material that is subject to the Hazardous Waste Manifest requirements of the EPA specified in 40 CFR Part 262.

1.20 Holidays - Those designated non-work days as established by the City Commission of the City of Fort Lauderdale.

1.21 Inspection – The term “inspection” and the act of inspecting as used in this Agreement is defined to mean the examination of construction to ensure that it conforms to the design concept expressed in the plans and specifications. This term shall not be construed to mean supervision, superintending and/or overseeing.

1.22 Notice of Award - The written notice by City to the Contractor stating that upon compliance by the Contractor with the conditions precedent enumerated therein, within the time specified that the City will sign and deliver this Agreement.

1.23 Notice to Proceed – A written notice given by the City to the Contractor fixing the date on which the Contract Time will commence to run and on which the Contract Time will end.

1.24 Plans - The drawings which show the character and scope of the work to be performed and which have been prepared or approved by the City and are referred to in the Contract Documents.

1.25 Premises (otherwise known as Site or Work Site) – means the land, buildings, facilities, etc. upon which the Work is to be performed.

1.26 Project – The total construction of the Work to be provided as defined in the Contract Documents.

1.27 Project Manager - The employee of the City, or other designated individual who is herein referred to as the Project Manager, will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the contract Documents in connection with completion of the Work in accordance with this Agreement. The Project Manager, or designee, shall be the authorized agent for the City unless otherwise specified.

1.28 Punch List - The City's list of Work yet to be done or be corrected by the Contractor, before the Final Completion date can be determined by the City.

1.29 Record Documents - A complete set of all specifications, drawings, addenda, modifications, shop drawings, submittals and samples annotated to show all changes made during the construction process.

1.30 Record Drawings or "As-Builts" - A set of drawings which show significant changes in the work made during construction and which are usually based on drawings marked up in the field and other data furnished by the contractor. These documents will be signed and sealed by the Engineer of Record or a Professional Land Surveyor licensed in the State of Florida.

1.31 Substantially Completed Date – A date when the Contractor has requested in writing, stating that the Work is substantially completed and is ready for an inspection and issuance of a final punch list for the Project.

1.32 Work – The entire completed delivered product or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating material and equipment into the product, all as required by the Contract Documents.

ARTICLE 2 – SCOPE OF WORK

2.1 The Contractor shall complete all work as specified or indicated in the Contract Documents. The Project for which the Work under the Contract Documents may be the whole or only part is generally described as follows:

FIRE STATION NO. 2
HEATING, VENTILATION AND AIR CONDITIONING (HVAC) UPGRADES
ITB **673-12019 -** PROJECT **12200 RE-BID**

2.2 All Work for the Project shall be constructed in accordance with the Drawings and Specifications. The Work generally involves:

PROJECT DESCRIPTION

This project is located at 528 NW 2nd St., in the City of Fort Lauderdale. The work includes, but is not limited to, partial demolition of the existing heating ventilation and air conditioning (HVAC) system, cleaning and sanitizing of the remaining ductwork. The new HVAC system also includes chillers, new air handler units (AHUs), new ceiling exhaust fans, and other items as indicated in the plans and specifications.

2.3 Within ten (10) days of the execution of this Agreement, the Contractor shall submit a Construction Schedule, Schedule of Values and a listing of those subcontractors that will be utilized by the Contractor. The general sequence of the work shall be submitted by the Contractor and approved by the City before any work commences. The City reserves the right to issue construction directives necessary to facilitate the Work or to minimize any conflict with operations.

ARTICLE 3 – PROJECT MANAGER

3.1 The Project Manager is hereby designated by the City as **Alex Rio, Project Manager I**, whose address is 100 N. Andrews Avenue, 5th Floor, Fort Lauderdale, FL 33301, telephone number: **(954) 828-5389**, and email address is **ario@fortlauderdale.gov**. The Project Manager will assume all duties and responsibilities and will have the rights and authorities assigned to the Project Manager in the Contract Documents in connection with completion of the Work in accordance with this Agreement.

ARTICLE 4 – CONTRACT DOCUMENTS

The Contract Documents which comprise the entire Agreement between the City and Contractor are attached to this Agreement, are made a part hereof and consist of the following:

4.1 This Agreement.

4.2 The Contract Documents may only be altered, amended, or repealed in accordance with the specific provisions of the terms of this Agreement.

4.3 Exhibits to this Agreement: (Plans sheets [ ] to [ ] inclusive).

4.4 Public Construction Bond, Performance Bond, Payment Bond and Certificates of Insurance.

4.5 Notice of Award and Notice to Proceed.

4.6 General Conditions as amended by the Special Conditions.

4.7 Technical Specifications.

4.8 Plans/Drawings.

4.9 Addenda number _____ through _____, inclusive.

4.10 Bid Form and supplement Affidavits and Agreements.

4.11 All applicable provisions of State and Federal Law.

4.12 Invitation to Bid No., _____, Instructions to Bidders, and Bid Bond.

4.13 Contractor's response to the City's Invitation to Bid No., _____, dated _____.

4.14 Schedule of Completion and Schedule of Values.

4.15 All amendments, modifications and supplements, change orders and work directive changes issued on or after the Effective Date of the Agreement.

4.16 Any additional documents that are required to be submitted under the Agreement.

4.17 Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Agreement. A copy of all permits shall be given to the City for inclusion in the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

In the event of any conflict between the documents or any ambiguity or missing specification or instruction, the following priority is established:

a. Specific direction from the City Manager (or designee).

b. Approved change orders, addenda or amendments.

c. Specifications (quality) and Drawings (location and quantity).

d. Supplemental conditions or special terms.

e. General Terms and Conditions.

f. This Agreement dated _____ and any attachments.

g. Invitation to Bid No., _____, and the specifications prepared by the City.

h. Contractor's response to the City's Invitation to Bid No., _____, dated _____.

i. Schedule of Values.

j. Schedule of Completion.

If during the performance of the Work, Contractor finds a conflict, error or discrepancy in the Contract Documents, Contractor shall so report to the Project Manager, in writing, at once and before proceeding with the Work affected shall obtain a written interpretation or clarification from the City.

It is the intent of the specifications and plans to describe a complete Project to be constructed in accordance with the Contract Documents. Any Work that may reasonably be inferred from the specifications or plans as being required to produce the intended result shall be supplied whether or not it is specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such works shall be interpreted in accordance with such meaning. Reference to standard specifications, manuals or codes of any technical society, organization or associations, or to the code of any governmental authority whether such reference be specific or implied, shall mean the latest standard specification, manual or code in effect as of the Effective Date of this Agreement, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of the City, the Contractor, or any of their agents or employees from those set forth in the Contract Documents.

ARTICLE 5 – CONTRACT TIME

5.1 The Contractor recognizes that **TIME IS OF THE ESSENCE**. The Work shall commence within **10** calendar days of the date of the Notice to Proceed.

5.2 The Work shall be Substantially Completed within **120** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

5.3 The Work shall be finally completed on the Final Completion Date and ready for final payment in accordance with this Agreement within **150** calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

ARTICLE 6 – CONTRACT PRICE

6.1 City shall pay Contractor for performance of the Work in accordance with Article 7, subject to additions and deletions by Change Order, as provided for in this Agreement.

6.2 The parties expressly agree that the Contract Price, which shall not exceed the amount of $_____, constitutes the total maximum compensation payable to Contractor for performing the Work, plus any Work done pursuant to a Change Order. The Contract Price is in accordance with the line item unit prices listed in the Bid. Line items are based on a unit price cost multiplied by a defined quantity. Any

additional duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change to the Contract Price.

6.3 The Contract Price constitutes the compensation payable to Contractor for performing the Work plus any Work done pursuant to a Change Order. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change in the Contract price.

ARTICLE 7 – PAYMENT

7.1 Contractor shall submit Applications for Payment in accordance with the Contract Documents. Applications for Payment will be processed by City as provided in the General Conditions.

7.2 Progress Payments. City shall make progress payments on account of the Contract Price on the basis of Contractor's monthly Applications for Payment, which shall be submitted by the Contractor between the first (1st) and the tenth (10th) day after the end of each calendar month for which payment is requested. All progress payments will be made on the basis of the progress of the Work completed.

7.3 Prior to Final Completion, progress payments will be made in an amount equal to ninety percent (90%) of the value of Work completed less in each case the aggregate of payments previously made.

7.4 Final Payment. Upon final completion of the Work in accordance with the General Conditions, as may be supplemented, the City shall pay Contractor an amount sufficient to increase total payments to one-hundred percent (100%) of the Contract Price. However, not less than ten percent (10%) of the Contract Price shall be retained until Record Drawings (as-builts), specifications, addenda, modifications and shop drawings, including all manufacturers' instructional and parts manuals are delivered to and accepted by the City.

7.5 City may withhold, in whole or in part, payment to such extent as may be necessary to protect itself from loss on account of:

7.5.1 Defective work not remedied.
7.5.2 Claims filed or reasonable evidence indicating probable filing of claims by other parties against Contractor or City because of Contractor's performance.
7.5.3 Failure of Contractor to make payments properly to Subcontractors or for material or labor.
7.5.4 Damage to another contractor not remedied.
7.5.5 Liquidated damages and costs incurred by Consultant for extended construction administration, if applicable.
7.5.6 Failure of Contractor to provide any and all documents required by the Contract Documents.

When the above grounds are removed or resolved satisfactory to the Project Manager, payment shall be made in whole or in part.

7.6 The City shall make payment to the Contractor in accordance with the Florida Prompt Payment Act, Section 218.70, Florida Statutes.

7.7 The City shall make payment to the Contractor through utilization of the City's P-Card Program.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

In order to induce the City to enter into this Agreement, Contractor makes the following representations upon which the City has relied:

8.1 Contractor is qualified in the field of public construction and in particular to perform the Work and services set forth in this Agreement.

8.2 Contractor has visited the Work Site, has conducted extensive tests, examinations and investigations and represents and warrants a thorough familiarization with the nature and extent of the Contract Documents, the Work, locality, soil conditions, moisture conditions and all year-round local weather and climate conditions (past and present), and, in reliance on such tests, examination and investigations conducted by Contractor and the Contractor's experts, has determined that no conditions exist that would in any manner affect the Proposed Price and that the project can be completed for the Proposed Price submitted within the Contract Time as defined in this Agreement. Furthermore, Contractor warrants and confirms that he is totally familiar with, understands and obligates Contractor to comply with all federal, state and local laws, ordinances, rules, regulations and all market conditions that affect or may affect the cost and price of materials and labor needed to fulfill all provisions of this Agreement or that in any manner may affect cost, progress or performance of the Work.

8.3 The Contractor has satisfied itself as to the nature and location of the Work under the Contract Documents, the general and local conditions of the Project, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, and roads, the conformation and conditions at the ground based on City provided reports, the type of equipment and facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under the Contract Documents.

8.4 The Contractor has also studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Works, and finds and has further determined that no conditions exist that would in any manner affect the Proposed Price and that the project can be completed for the Proposed Price submitted.

8.5 Contractor has made or caused to be made examinations, investigations, tests and studies of such reports and related data in addition to those referred to in Paragraphs 8.2, 8.3 and 8.4 above as he deems necessary for the performance of the Work at the Contract Prices, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are, or will be, required by Contractor for such purposes.

8.6 Contractor has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

8.7 Contractor has given City written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution by City is acceptable to the Contractor.

8.8 Labor

8.8.1 The Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. The Contractor shall at all times maintain good discipline and order at the site.

8.8.2 The Contractor shall, at all times, have a competent superintendent, capable of reading and thoroughly understanding the drawings and specifications, as the Contractor's agent on the Work, who shall, as the Contractor's agent, supervise, direct and otherwise conduct the Work.

8.8.3 The Contractor shall designate the superintendent on the job to the City, in writing, immediately after receipt of the Notice to Proceed. The Contractor understands and agrees that the superintendent's physical presence on the job site is indispensable to the successful completion of the Work. If the superintendent is frequently absent from the job site, the Project Manager may deliver written notice to the Contractor to stop work or terminate the Contract in accordance with Article 17.

8.8.4 The Contractor shall assign personnel to the job site that have successfully completed training programs related to trench safety, confined space and maintenance of traffic. A certified "competent person" shall be assigned to the job site. Personnel certified by the International Municipal Signal Associations with Florida Department of Transportation qualifications are required relative to maintenance of traffic. Failure to pursue the Work with the properly certified supervisory staff may result in notice to stop work or terminate the Contract in accordance with Article 17.

8.9 Materials:

8.9.1 The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of Work.

8.9.2 All material and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. Suppliers shall be selected and paid by the Contractor; the City reserves the right to approve all suppliers and materials.

8.10 Work Hours: Except in connection with the safety or protection of persons, or the Work, or property at the site or adjacent thereto, and except as otherwise indicated in

the Supplementary Conditions, all work at the site shall be performed during regular working hours between 7 a.m. and 6:00 p.m., Monday through Friday. The Contractor will not permit overtime work or the performance of work on Saturday, Sunday or any legal holiday (designated by the City of Fort Lauderdale) without the Project Manager's written consent at least seventy-two (72) hours in advance of starting such work. If the Project Manager permits overtime work, the Contractor shall pay for the additional charges to the City with respect to such overtime work. Such additional charges shall be a subsidiary obligation of the Contractor and no extra payment shall be made to the Contractor for overtime work. It shall be noted that the City's Inspector work hours are from 8:00 a.m. to 4:30 p.m. and any work requiring inspection oversight being performed outside of this timeframe shall be paid for by the Contractor as Inspector overtime. The cost to the Contractor to reimburse the City for overtime inspection is established at direct-labor and overtime costs for each person or inspector required. Incidental overtime costs for engineering, testing and other related services will also be charged to the Contractor at the actual rate accrued.

8.11 Patent Fee and Royalties: The Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work, or any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. The Contractor hereby expressly binds himself or itself to indemnify and save harmless the City from all such claims and fees and from any and all suits and action of every name and description that may be brought against City on account of any such claims, fees, royalties, or costs for any such invention or patent, and from any and all suits or actions that may be brought against said City for the infringement of any and all patents or patent rights claimed by any person, firm corporation or other entity.

8.12 Permits: The Contractor shall obtain and pay for all permits and licenses. There shall be no allowance for Contractor markup, overhead or profit for permits and licenses. The Contractor shall pay all government charges which are applicable at the time of opening of proposals. It shall be the responsibility of the Contractor to secure and pay for all necessary licenses and permits of a temporary nature necessary for the prosecution of Work.

8.13 Law and Regulations: The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations applicable to the Work. If the Contractor observes that the specifications or plans are at variance therewith, the Contractor shall give the Project Manager prompt written notice thereof, and any necessary changes shall be adjusted by any appropriate modifications. If the Contractor performs any work knowing or having reason to know that it is contrary to such laws, ordinances, rules and regulations, and without such notice to the Project Manager, the Contractor shall bear all costs arising therefrom; however, it shall not be the Contractor's primary responsibility to make certain that the specifications and plans are in accordance with such laws, ordinances, rules and regulations.

8.14 Taxes: The Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by him in accordance with the laws of the City of Fort Lauderdale, County of Broward, State of Florida.

8.15 Contractor Use of Premises: The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workmen to areas permitted

by law, ordinances, permits and/or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

The Contractor shall not enter upon private property for any purpose without first securing the permission of the property owner in writing and furnishing the Project Manager with a copy of said permission. This requirement will be strictly enforced, particularly with regard to such vacant properties as may be utilized for storage or staging by the Contractor.

The Contractor shall conduct his work in such a manner as to avoid damage to adjacent private or public property. Any damage to existing structures of work of any kind, including permanent reference markers or property corner markers, or the interruption of a utility service, shall be repaired or restored promptly at no expense to the City or property owner.

The Contractor will preserve and protect all existing vegetation such as trees, shrubs and grass on or adjacent to the site which do not reasonably interfere with the construction, as determined by the Project Manager. The Contractor will be responsible for repairing or replacing any trees, shrubs, lawns and landscaping that may be damaged due to careless operation of equipment, stockpiling of materials, tracking of grass by equipment or other construction activity. The Contractor will be liable for, or will be required to replace or restore at no expense to the City all vegetation not protected or preserved as required herein that may be destroyed or damaged.

During the progress of the work, the Contractor shall keep the premises free from accumulations of waste materials, rubbish and debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials and shall leave the site clean and ready for occupancy by the City. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents at no cost to the City.

8.16 Project Coordination: The Contractor shall provide for the complete coordination of the construction effort. This shall include, but not necessarily be limited to, coordination of the following:

8.16.1 Flow of material and equipment from suppliers.
8.16.2 The interrelated work with affected utility companies.
8.16.3 The interrelated work with the City where tie-ins to existing facilities are required.
8.16.4 The effort of independent testing agencies.
8.16.5 Notice to affected property owners as may be directed by the Project Manager.

8.17 Project Record Documents and Final As-Builts (Record Drawings): Contractor shall be responsible for maintaining up-to-date redline as-built drawings, on site, at all times during construction. All as-built information shall be surveyed and verified by a professional land surveyor registered in the State of Florida. Contractor shall provide the City with a minimum of three (3) sets of signed and sealed record drawings (Final

As-Builts) and a CD of the electronic drawings files created in AutoCad 2014 or later. All costs associated with survey work required for construction layout and as-built preparation shall be the responsibility of the Contractor.

8.18 Safety and Protection:

8.18.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

8.18.1.1 All employees working on the project and other persons who may be affected thereby.

8.18.1.2 All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

8.18.1.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

8.18.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and utilities when execution of the Work may affect them at least seventy-two (72) hours in advance (unless otherwise required). All damage, injury or loss to any property caused, directly or indirectly, in whole or in part by the Contractor, any subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by the Contractor. The Contractor's duties and responsibilities for safety and protection of the Work shall continue until such time as all the Work is completed and accepted by the City.

8.19 Emergencies: In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the City is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Project Manager prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby.

8.20 Risk of Loss: The risk of loss, injury or destruction shall be on the Contractor until acceptance of the Work by the City. Title to the Work shall pass to the City upon acceptance of the Work by the City.

8.21 Environmental: The Contractor has fully inspected the Premises and agrees, except as to the presence of any asbestos, to accept the Premises in an "as is" physical condition, without representation or warranty by the City of any kind, including, without limitation, any and all existing environmental claims or obligations that may arise from the presence of any "contamination" on, in or about the Premises. Further, Contractor and all entitles claiming by, through or under the Contractor, releases and discharges

the City, from any claim, demand, or cause of action arising out of or relating to the Contractor's use, handling, storage, release, discharge, treatment, removal, transport, decontamination, cleanup, disposal and/or presence of any hazardous substances including asbestos on, under, from or about the Premises. The Contractor shall have no liability for any pre-existing claims or "contamination" on the Premises.

The Contractor shall not use, handle, store, discharge, treat, remove, transport, or dispose of Hazardous Substances including asbestos at, in, upon, under, to or from the Premises until receipt of instructions from the City. At such time, a City approved Change Order, which shall not include any profit, shall authorize the Contractor to perform such services.

The Contractor shall immediately deliver to the Project Manager complete copies of all notices, demands, or other communications received by the Contractor from any governmental or quasi-governmental authority or any insurance company or board of fire underwriters or like or similar entities regarding in any way alleged violations or potential violations of any Environmental Law or otherwise asserting the existence or potential existence of any condition or activity on the Premises which is or could be dangerous to life, limb, property, or the environment.

For other and additional consideration, the Contractor hereby agrees, at its sole cost and expense, to indemnify and protect, defend, and hold harmless the City and its respective employees, agents, officials, officers, representatives, contractors and subcontractors, successors, and assigns (hereafter the "City") from and against any and all claims, demands, losses, damages, costs, expenses, including but not limited to mitigation, restoration, and natural restoration expenses, liabilities, assessments, fines, penalties charges, administrative and judicial proceedings and orders, judgments, causes of action, in law or in equity, remedial action requirements and/or enforcement actions of any kind (including, without limitation, attorneys' fees and costs) directly or indirectly arising out of or attributable to, in whole or in part, the Contractor's use, handling, storage, release, threatened release, discharge, treatment, removal, transport, decontamination, cleanup, disposal and/or presence of a Hazardous Substance (excluding asbestos) on, under, from, to or about the Premises or any other activity carried on or undertaken on or off the Premises by the Contractor or its employees, agents or subcontractors, in connection with the use, handling, storage, release, threatened release, discharge, treatment, mitigation, natural resource restoration, removal, transport, decontamination, cleanup, disposal and/or presence or any Hazardous Substance including asbestos located, transported, or present on, undue, from, to, or about the Premises. This indemnity is intended to be operable under 42 U.S.C. sections 9607, as amended, and any successor section.

The scope of the indemnity obligations includes, but is not limited to: (a) all consequential damages; (b) the cost of any required or necessary repair, cleanup, or detoxification of the applicable real estate and the preparation and implementation of any closure, remedial or other required plan, including without limitation; (i) the costs of removal or remedial action incurred by the United States government or the State of Florida or response costs incurred by any other person, or damages from injury to destruction of, or loss of, natural resources, including the cost of assessing such injury, destruction, or loss, incurred pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, as amended; (ii) the clean-up costs, fines, damages, or penalties incurred pursuant to any applicable provisions of Florida law;

and (iii) the cost and expenses of abatement, correction or cleanup, fines, damages, response costs, or penalties which arise from the provisions of any other statute, law, regulation, code ordinance, or legal requirement state or federal; and (c) liability for personal injury or property damage arising under any statutory or common law tort theory, including damages assessed for the maintenance of a public private nuisance, response costs, or for the carrying on of an abnormally dangerous activity.

8.22 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any other reason or allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

8.23 No Liens: If any Subcontractor, supplier, laborer, or materialmen of Contractor or any other person directly or indirectly acting for or through Contractor files or attempts to file a mechanic's or construction lien against the real property on which the work is performed or any part or against any personal property or improvements or claim against any monies due or to become due from the City to Contractor or from Contractor to a Subcontractor, for or on account of any work, labor, services, material, equipment, or other items furnished in connection with the Work or any Change Order, Contractor agrees to satisfy, remove, or discharge such lien or claim at its own expense by bond, payment, or otherwise within twenty (20) days of the filing or from receipt of written notice from the City.

Additionally, until such time as such lien or claim is satisfied, removed or discharged by Contractor, all monies due to Contractor, or that become due to Contractor before the lien or claim is satisfied, removed or otherwise discharged, shall be held by City as security for the satisfaction, removal and discharge of such lien and any expense that may be incurred while obtaining such. If Contractor shall fail to do so, City shall have the right, in addition to all other rights and remedies provided by this Agreement or by law, to satisfy, remove, or discharge such lien or claim by whatever means City chooses at the entire and sole cost and expense of Contractor which costs and expenses shall, without limitation, include attorney's fees, litigation costs, fees and expenses and all court costs and assessments.

8.24 Weather Emergencies: Upon issuance of a Hurricane Watch by the National Weather Service, the Contractor shall submit to the City a plan to secure the work area in the event a Hurricane Warning is issued. The plan shall detail how the Contractor will secure the Premises, equipment and materials in a manner as to prevent damage to the Work and prevent materials and equipment from becoming a hazard to persons and property on and around the Premises. The plan shall include a time schedule required to accomplish the hurricane preparations and a list of emergency contacts that will be available and in the City before, during and immediately after the storm.

Upon issuance of a Hurricane Warning by the National Weather Service, if the Contractor has not already done so, the Contractor shall implement its hurricane preparedness plan. Cost of development and implementation of the hurricane preparedness plan shall be considered as incidental to construction. Cost of any clean up and rework required after the storm will be considered normal construction risk within Florida and shall not entitle the Contractor to any additional compensation. Contractor shall be entitled to request an extension in time for completion of the Work, in accordance with the provisions of Article 15 of this Agreement, equal to the time he is shut down for implementation of the preparedness plan, the duration of the storm and a reasonable period to restore the Premises.

8.25 Force Majeure: No Party shall hold the other responsible for damages or for delays in performance caused by force majeure, acts of God, or other acts or circumstances beyond the control of the other party or that could not have been reasonably foreseen and prevented. For this purposes, such acts or circumstances shall include, but not be limited to weather conditions affecting performance, floods, epidemics, war, riots, strikes, lockouts, or other industrial disturbances, or protest demonstrations. Should such acts or circumstances occur, the parties shall use their best efforts to overcome the difficulties arising therefrom and to resume the Work as soon as reasonably possible with the normal pursuit of the Work.

Inclement weather, continuous rain for less than three (3) days or the acts or omissions of subcontractors, third-party contractors, materialmen, suppliers, or their subcontractors, shall not be considered acts of force majeure.

No Party shall be liable for its failure to carry out its obligations under the Agreement during a period when such Party is rendered unable by force majeure to carry out its obligation, but the obligation of the Party or Parties relying on such force majeure shall be suspended only during the continuance of the inability and for no longer period than the unexpected or uncontrollable event.

The Contractor further agrees and stipulates, that its right to excuse its failure to perform by reason of force majeure shall be conditioned upon giving written notice of its assertion that a Force Majeure delay has commenced within 96 hours after such an occurrence. The CONTRACTOR shall use its reasonable efforts to minimize such delays. The CONTRACTOR shall promptly provide an estimate of the anticipated additional time required to complete the Project.

8.26 Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assisted Contracts: The recipient shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of any DOT-assisted contract or in the administration of its DBE program or the requirements of 49 CFR part 26. The recipient shall take all necessary and reasonable steps under 49 CFR part 26 to ensure nondiscrimination in the award and administration of DOT-assisted contracts. The recipient's DBE program, as required by 49 CFR part 26 and as approved by DOT, is incorporated by reference in this agreement. Implementation of this program is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the recipient of its failure to carry out its approved program, the Department may impose sanctions as provided for under part 26 and may, in appropriate cases, refer the matter for enforcement under 18

U.S.C. 1001 and/or the Program Fraud Civil Remedies Act of 1986 (31 U.S.C. 3801 *et seq.*).

Additionally, the contractor assures that they, the sub recipient or the subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate. (This additional language must be included in each subcontract the prime contractor signs with a subcontractor.)

ARTICLE 9 – CITY'S RESPONSIBILITIES

9.1 The City shall furnish the data required of the City under the Contract Documents promptly and shall make payments to the Contractor promptly after they are due as provided in Article 7.

9.2 The City's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in the Contract Documents.

9.3 Technical Clarifications and Interpretations:

9.3.1 The City shall issue, with reasonable promptness, such written clarifications or interpretations of the Contract Documents as it may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Should the Contractor fail to request interpretation of questionable items in the Contract Documents, the City shall not entertain any excuse for failure to execute the Work in a satisfactory manner.

9.3.2 The City shall interpret and decide matters concerning performance under the requirements of the Contract Documents, and shall make decisions on all claims, disputes or other matters in question. Written notice of each claim, dispute or other matter will be delivered by claimant to the other Party but in no event later than five (5) days after the occurrence of event, and written supporting date will be submitted to the other Party within five (5) days after such occurrence. All written decisions of the City on any claim or dispute will be final and binding.

9.4 The Contractor shall perform all Work to the reasonable satisfaction of the City in accordance with the Contract Documents. In cases of disagreement or ambiguity, the City shall decide all questions, difficulties, and disputes of whatever nature, which may arise under or by reason of this Agreement or the quality, amount and value of the Work, and the City's decisions on all claims, questions and determination are final.

ARTICLE 10 – BONDS AND INSURANCE

10.1 Public Construction and Other Bonds: The Contractor shall furnish Public Construction or Performance and Payment Bonds ("Bond"), each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all

the Contractor's obligations under the Contract Documents. These Bonds shall remain in effect until at least one (1) year after the date of final payment, except as otherwise provided by law. All Bonds shall be furnished and provided by the surety and shall be in substantially the same form as prescribed by the Contract Documents and be executed by such sureties as (i) are licensed to conduct business in the State of Florida, and (ii) are named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department and (iii) otherwise meet the requirements set forth herein that apply to sureties. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

10.1.1 Performance Bond: The Contractor shall execute and record in the public records of Broward County, Florida, a payment and performance bond in an amount at least equal to the Contract Price with a surety insurer authorized to do business in the State of Florida as surety, ("Bond"), in accordance with Section 255.05, Florida Statutes (2014), as may be amended or revised, as security for the faithful performance and payment of all of the Contractor's obligations under the Contract Documents.

A Corporate Surety Bond legally issued, meeting the approval of, and running to the City in an amount not less than the Contract Price of such improvements, conditioned that the Contractor shall maintain and make all repairs to the improvements constructed by the Contractor at their own expense and free of charge to the City, for the period of one (1) year after the date of acceptance of the Work within such period by reason of any imperfection of the material used or by reason of any defective workmanship, or any improper, imperfect or defective preparation of the base upon which any such improvement shall be laid.

10.2 Disqualification of Surety: If the Surety on any Bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the State of Florida or it ceases to meet the requirements of clauses (i) and (ii) of Paragraph 10.1, the Contractor shall within five (5) days thereafter substitute another Bond and Surety, both of which shall be acceptable to the City.

10.3 Insurance

10.3.1 Contractor shall provide and shall require all of its sub-contractors to provide, pay for, and maintain in force at all times during the term of the Agreement, such insurance, including Property Insurance (Builder's Risk), Commercial General Liability Insurance, Business Automobile Liability Insurance, Workers' Compensation Insurance, Employer's Liability Insurance, and Umbrella/Excess Liability, as stated below, as well as Professional Liability insurance in the amount of $1,000,000 for any Architectural and or Engineering requirements associated with the fulfillment of the contract if required. Such policy or policies shall be issued by companies authorized to do business in the State of Florida and having agents upon whom service of process may be made in the State of Florida. **A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the**

insurance companies' names for all required coverage, and the dollar amounts of the coverage.

A. The City is required to be named as additional insured on the Commercial General Liability insurance policy. BINDERS ARE UNACCEPTABLE. The insurance coverage required shall include those classifications, as listed in standard liability insurance manuals, which most nearly reflect the operations of the Contractor. Any exclusions or provisions in the insurance maintained by the Contractor that precludes coverage for the work contemplated in this Agreement shall be deemed unacceptable, and shall be considered a breach of contract.

B. The Contractor shall provide the City an original Certificate of Insurance for policies required by Article 10. All certificates shall state that the City shall be given ten (10) days' notice prior to expiration or cancellation of the policy. The insurance provided shall be endorsed or amended to comply with this notice requirement. In the event that the insurer is unable to accommodate, it shall be the responsibility of the Contractor to provide the proper notice. Such notification will be in writing by registered mail, return receipt requested and addressed to the Finance Department. Such policies shall: (1) name the insurance company or companies affording coverage acceptable to the City, (2) state the effective and expiration dates of the policies, (3) include special endorsements where necessary. Such policies provided under Article 10 shall not be affected by any other policy of insurance, which the City may carry in its own name.

C. Contractor shall as a condition precedent of this Agreement, furnish to the City of Fort Lauderdale, c/o Project Manager, 100 N. Andrews Avenue, Fort Lauderdale, FL 33301, Certificate(s) of Insurance upon execution of this Agreement, which indicate that insurance coverage has been obtained which meets the requirements as outlined below:

10.3.2 Property Insurance (Builder's Risk): **- N/A**

10.3.3 Commercial General Liability

A. Limits of Liability:

Bodily Injury and Property Damage - Combined Single Limit	
Each Occurrence	$1,000,000
Project Aggregate	$1,000,000
General Aggregate	$2,000,000
Personal Injury	$1,000,000
Products/Completed Operations	$1,000,000

B. Endorsements Required:
City of Fort Lauderdale included as an Additional Insured
Broad Form Contractual Liability
Waiver of Subrogation
Premises/Operations
Products/Completed Operations
Independent Contractors
Owners and Contractors Protective Liability
Contractor's Pollution Liability **- N/A**

10.3.4 Business Automobile Liability

A. Limits of Liability:
Bodily Injury and Property Damage - Combined Single Limit
All Autos used in completing the contract including Hired, Borrowed or Non-Owned Autos
Any One Accident $1,000,000

B. Endorsements Required:
Waiver of Subrogation

10.3.5 Workers' Compensation and Employer's Liability Insurance

Limits: Workers' Compensation – Per Florida Statute 440
Employers' Liability - $500,000

Any firm performing work on behalf of the City of Fort Lauderdale must provide Workers' Compensation insurance. Exceptions and exemptions can only be made if they are in accordance with Florida Law.

Contractor must be in compliance with all applicable State and Federal workers' compensation laws, including the U.S. Longshore Harbor Workers' Act or Jones Act.

10.3.6 Umbrella/Excess Liability: The Contractor shall provide umbrella/excess coverage with limits of no less than $2,000,000 excess of Commercial General Liability, Automobile Liability and Employer's Liability.

10.3.7 Crane/On-Hook: The Contractor will need to provide documentation of his Crane/On-Hook coverage in the amount of $1,000,000, if any cranes are used during the course of the Project. Additionally, the Contractor will need to provide documentation of his subcontractors Crane/On-Hook coverage in the amount of $1,000,000 if any of his subcontractors utilize any cranes during the course of this Project.

10.3.8 All insurance policies required above shall be issued by companies authorized to do business under the laws of the State of Florida, with the following qualifications:

The Contractor's insurance must be provided by an A.M. Best's "A-" rated or better insurance company authorized to issue insurance policies in the State of Florida,

subject to approval by the City's Risk Manager. Any exclusions or provisions in the insurance maintained by the Contractor that precludes coverage for work contemplated in this project shall be deemed unacceptable, and shall be considered breach of contract.

NOTE: CITY PROJECT NUMBER AND NAME MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORTLAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED".

A Sample Insurance Certificate shall be included with the proposal to demonstrate the firm's ability to comply with insurance requirements. Provide a previous certificate or other evidence listing the insurance companies' names for all required coverage, and the dollar amounts of the coverage.

Compliance with the foregoing requirements shall not relieve the Contractor of their liability and obligation under this section or under any other section of this Agreement.

The Contractor shall be responsible for assuring that the insurance certificates required in conjunction with this Section remain in force for the duration of the Project. If insurance certificates are scheduled to expire during the contractual period, the Contractor shall be responsible for submitting new or renewed insurance certificates to the City at a minimum of thirty (30) calendar days in advance of such expiration. In the event that expired certificates are not replaced with new or renewed certificates that cover the contractual period, the City shall:

A. Suspend the Agreement until such time as the new or renewed certificates are received by the City.

B. The City may, at its sole discretion, terminate the Agreement for cause and seek damages from the Contractor in conjunction with the violation of the terms and conditions of the Agreement.

ARTICLE 11- WARRANTY AND GUARANTEE, TESTS AND INSPECTIONS, CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

11.1 Warranty: The Contractor warrants and guarantees to the City that all Work will be in accordance with the Contract Documents and will not be defective. Prompt notice of all defects shall be given to the Contractor. All defective work, whether or not in place, may be rejected, corrected or accepted as provided in this Article.

11.1.1 Warranty of Title: The Contractor warrants to the City that it possesses good, clear and marketable title to all equipment and materials provided and that there are no pending liens, claims or encumbrances against the equipment and materials.

11.1.2 Warranty of Specifications: The Contractor warrants that all equipment, materials and workmanship furnished, whether furnished by the Contractor, its subcontractors or suppliers, will comply with the specifications, drawings and

other descriptions supplied or adopted and that all services will be performed in a workmanlike manner.

11.1.3 Warranty of Merchantability: The Contractor warrants that any and all equipment to be supplied pursuant to this Agreement is merchantable, free from defects, whether patent or latent in material or workmanship, and fit for the ordinary purposes for which it is intended.

11.2 Tests and Inspections: Contractor shall retain the services of an independent, certified, testing lab to perform all testing as required by the specifications, Contract drawings, and any applicable permitting agency. Contractor shall provide evidence of certification to the City before the work and testing is done. Testing results shall be submitted to the Engineer for review and approval at the time the results are provided to the Contractor. The Contractor shall give the Project Manager and City Inspector a minimum of twenty-four (24) hours' advanced notice of readiness of the Work for all required inspections, tests, or approvals and shall notify all applicable permitting agencies in a timely manner based on requirements set forth in the permit documents.

11.2.1 Neither observations by the Project Manager nor inspections, tests or approvals by others shall relieve the Contractor from its obligations to perform the Work in accordance with the Contract Documents.

11.3 Uncovering Work: If any work that is to be inspected, tested or approved is covered without approval or consent of the Project Manager, it must, if requested by the Project Manager, be uncovered for observation and/or testing. Such uncovering and replacement shall be at the Contractor's sole expense unless the Contractor has given the Project Manager timely notice of the Contractor's intention to cover such Work and the Project Manager has not acted with reasonable promptness in response to such notice.

11.3.1 If the Project Manager considers it necessary or advisable that Work covered in accordance with Paragraph 11.2.1, 11.2.2 and 11.2.3 be observed by the City or inspected or tested by others, the Contractor at the City's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Project Manager may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, the Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate deductive Change Order shall be issued. If, however, such work is not found to be defective, the Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection testing and reconstruction if he makes a claim therefore as provided in Articles 14 and 15.

11.4 City May Stop the Work: If the Work is defective, or the Contractor fails to supply sufficient skilled supervisory personnel or workmen or suitable materials or equipment or the work area is deemed unsafe, the City may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the City to stop the Work shall not give rise to any duty on the part of the City to exercise this right for the benefit of the Contractor or any other party.

The City will not award any increase in Contract Price or Contract Time if the Work is stopped due to the circumstances described herein.

11.5 Correction or Removal of Defective Work Before Final Payment: If required by the Project Manager, the Contractor shall promptly, without cost to the City and as Specified by the Project Manager, either correct any defective Work, whether or not fabricated, installed or completed, or if the Work has been rejected by the City remove it from the site and replace it with non-defective Work.

11.6 One Year Correction Period After Final Payment: If within one (1) year after the date of final acceptance, or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work is found to be defective, the Contractor shall promptly, without cost to the City and in accordance with the City's written instructions, either correct such defective Work, or, if it has been rejected by the City, remove it from the site and replace it with non-defective Work.

If The Contractor does not promptly comply with the terms of such instructions or in an emergency where delay would cause serious risk of loss or damage, the City may have the defective Work corrected or the rejected Work removed and replaced, and all direct and indirect costs for such removal and replacement, including compensation for additional professional services, shall be paid by the Contractor.

11.7 Acceptance of Defective Work, Deductions: If, instead of requiring correction or removal and replacement of defective Work, the City, at the city's sole option, prefers to accept it, the City may do so. In such a case, if acceptance occurs prior to the Project Manager's recommendation of final payments, a Change Order shall be issued incorporating the necessary revisions in the Contracts Documents, including appropriate reduction in the Contract Price; or if the acceptance occurs after such recommendation, an appropriate amount shall be paid by the Contractor to the City.

11.8 City May Correct Defective Work: If the Contractor fails within a reasonable time after written notice of the Project Manager to proceed to correct defective Work or to remove and replace rejected Work as required by the Project Manager in accordance with Paragraph 11.5, or if the Contractor fails to perform the Work in accordance with the Contract Documents, the City may, after seven (7) days written notice to the Contractor, correct and remedy any such deficiency. In exercising its rights under this paragraph, the City shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, the City may exclude the Contractor from all or part of the site, take possession of all or part of the Work, suspend the Contractor's services related thereto and take possession of the Contractor's tools, construction equipment and materials stored at the site or elsewhere. The Contractor shall allow the City's representative agents and employees such access to the site as may be necessary to enable the City to exercise its rights under this paragraph. All direct and indirect costs of the City in exercising such rights shall be charged against the Contractor in an amount verified by the Project Manager, and a Change Order shall be issued incorporating the necessary revisions in the Contract Documents and a reduction in the Contract Price. Such direct and indirect costs shall include, in particular but without limitation, compensation for additional professional services required and costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the Contractor's defective Work. The Contractor shall not

be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by the City of the City's right hereunder.

ARTICLE 12 – INDEMNIFICATION

12.1 Disclaimer of Liability: The City shall not at any time, be liable for injury or damage occurring to any person or property from any cause, whatsoever, arising out of Contractor's construction and fulfillment of this agreement.

12.2 Indemnification: For other, additional good valuable consideration, the receipt and sufficiency of which is hereby acknowledged:

12.2.1 Contractor shall, at its sole cost and expense, indemnify and hold harmless the City, its representatives, employees and elected and appointed officials from or on account of all claims, damages, losses, liabilities and expenses, direct, indirect or consequential including but not limited to fees and charges of engineers, architects, attorneys, consultants and other professionals and court costs arising out of or in consequence of the performance of this Agreement at all trial and appellate levels. Indemnification shall specifically include but not be limited to claims, damages, losses, liabilities and expenses arising out of or from (a) the negligent or defective design of the project and Work of this Agreement; (b) any act, omission or default of the Contractor, its Subcontractors, agents, servants or employees; (c) any and all bodily injuries, sickness, disease or death; (d) injury to or destruction of tangible property, including any resulting loss of use; (e) other such damages, liabilities, or losses received or sustained by any person or persons during or on account of any operations connected with the construction of this Project including the warranty period; (f) the use of any improper materials; (g) any construction defect including both patent and latent defects; (h) failure to timely complete the work; (i) the violation of any federal, state, county or city laws, ordinances or regulations by Contractor, its subcontractors, agents, servants, independent contractors or employees; (j) the breach or alleged breach by Contractor of any term of the Agreement, including the breach or alleged breach of any warranty or guarantee.

12.2.2 Contractor agrees to indemnify, defend, save and hold harmless the City, its officers, agents and employees, from all damages, liabilities, losses, claims, fines and fees, and from any and all suits and actions of every name and description that may be brought against City, its officers, agents and employees, on account of any claims, fees, royalties, or costs for any invention or patent and/or for the infringement of any and all copyrights or patent rights claimed by any person, firm, or corporation.

12.2.3 Contractor shall pay all claims, losses, liens, settlements or judgments of any nature in connection with the foregoing indemnifications including, but not limited to, reasonable attorney's fees and costs for trails and appeals.

12.2.4 If any Subcontractor, supplier, laborer, or materialmen of Contractor or any other person directly or indirectly acting for or through Contractor files or attempts to file a mechanic's or construction lien against the real property on which the work is performed or any part or against any personal property or improvements thereon or make a claim against any monies due or to become due from the City to Contractor or from Contractor to a Subcontractor, for or on account of any work, labor, services, material, equipment, or other items furnished in connection with the Work or any change order, Contractor agrees to satisfy, remove, or discharge such lien or claim at its own expense by bond, payment, or otherwise within five (5) days of the filing or from receipt of written notice from the City.

Additionally, until such time as such lien or claim is satisfied, removed or discharged by Contractor, all monies due to Contractor, or that become due to Contractor before the lien or claim is satisfied, removed or otherwise discharged, shall be held by City as security for the satisfaction, removal and discharge of such lien and any expense that may be incurred while obtaining the discharge. If Contractor shall fail to do so, City shall have the right, in addition to all other rights and remedies provided by this Agreement or by law, to satisfy, remove, or discharge such lien or claim by whatever means City chooses at the entire and sole cost and expense of Contractor which costs and expenses shall, without limitation, include attorney's fees, litigation costs, fees and expenses and all court costs and assessments, and which shall be deducted from any amount owing to Contractor. In the event the amount due Contractor is less than the amount required to satisfy Contractor's obligation under this, or any other article, paragraph or section of this Agreement, the Contractor shall be liable for the deficiency due the City.

12.2.5 The Contractor and the City agree that Section 725.06(2), Florida Statutes controls the extent and limits of the indemnification and hold harmless provisions of this Agreement, if any, and that the parties waive any defects in the wording of this Article that runs afoul of said statutory section.

ARTICLE 13 – CHANGES IN THE WORK

13.1 Without invalidating this Agreement, the City may, at any time or from time to time order additions, deletions or revisions in the Work through the issuance of Change Orders. Upon receipt of a Change Order, the Contractor shall proceed with the Work involved. All Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in Article 14 or Article 15 on the basis of a claim made by either Party.

13.2 The Project Manager may authorize minor changes in the work not involving an adjustment in the Contract Price or the Contract Time, which are consistent with the overall intent of the Contract Documents. Such changes must be in writing and signed by the City and the Contractor.

13.3 If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it will be the Contractor's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. The Contractor shall furnish proof of such adjustment to the City.

ARTICLE 14 – CHANGE OF CONTRACT PRICE

Change of Contract Price, approved by City, shall be computed as follows:

14.1 Cost of the Work: The term "Cost of the Work" means the sum of all direct costs necessarily incurred and paid by Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by the City, these costs shall be in amounts no higher than those prevailing in the City and shall include only the following items and shall not include any of the costs itemized in Paragraph 14.3:

14.1.1 Payroll costs for employees in the direct employ of the Contractor in the performance of the Work under schedules of job classifications agreed upon by the City and the Contractor. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus and cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, worker's compensation, health and retirement benefits, bonuses, sick leave, vacation and applicable holiday pay.

14.1.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage, and required suppliers and field services. All cash discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to the City, and the Contractor shall make provisions so that they may be obtained.

14.1.3 Supplemental costs including the following:

14.1.3.1 Cost, including transportation and maintenance of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work.

14.1.3.2 Rentals of all construction equipment and machinery and the parts whether rented from the Contractor or others in accordance with rental agreements approved by the City, and the costs of transporting, loading, unloading, installation, dismantling and removal. The rental of any such equipment, machinery or parts shall cease when the use is no longer necessary for the Work.

14.1.3.3 Sales, consumer, use or similar taxes related to the Work and for which the Contractor is liable, imposed by laws and regulations.

14.1.3.4 Royalty payments and fees for permits and licenses.

14.1.3.5 The cost of utilities, fuel and sanitary facilities at the Work site.

14.1.3.6 Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

14.1.3.7 Cost of premiums for additional bonds and insurance required because of changes in the Work.

14.2 The Contract Price may only be increased by a Change Order when Work is modified in accordance with Article 13 and approved by the City in writing. Any claim for an increase in the Contract Price resulting from a Change Order shall be based on written notice delivered to the Project Manager within ten (10) days of the occurrence of the Change Order giving rise to the claim. Notice of the amount of the claim with supporting data shall be included in the Change Order and delivered within twenty (20) days of such occurrence unless Project Manager allows an additional period of time to ascertain accurate cost data. Any change in the Contract Price resulting from any such claim shall be incorporated in the Change Order. **IT IS EXPRESSLY AND SPECIFICALLY AGREED THAT ANY AND ALL CLAIMS FOR CHANGES TO THE CONTRACT PRICE SHALL BE WAIVED IF NOT SUBMITTED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THIS SECTION.**

14.3 Not Included in the Cost of the Work: The term "cost of the Work" shall not include any of the following:

14.3.1 Payroll costs and other compensation of the Contractor's officers executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditor, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by the Contractor whether at the site or in the Contractor's principal or branch office for general administration of the work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 14.1.1, all of which are to be considered administrative costs covered by the Contractor's fee.

14.3.2 Expenses of the Contractor's principal and branch offices other than the Contractor's office at the site.

14.3.3 Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work and charges against the Contractor for delinquent payments.

14.3.4 Cost of premiums for all bonds and for all insurance whether or not the Contractor is required by the Contract Documents to purchase and maintain the same.

14.3.5 Costs due to the negligence of the Contractor, any subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

14.3.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 14.1

14.4 Basis of Compensation: The Contractor's compensation, allowed to the Contractor for overhead and profit, shall be determined as follows:

14.4.1 A mutually acceptable negotiated fee:

14.4.1.1 For costs incurred under Paragraphs 14.1.1 and 14.1.2, the Contractor's fee shall not exceed five percent (5%).

14.4.1.2 No fee shall be payable on the basis of costs itemized under Paragraphs 14.1.3.1, 14.1.3.2, 14.1.3.3, 14.1.3.4, 14.1.3.5, 14.1.3.6, 14.1.3.7, 14.3.1, 14.3.2, 14.3.3, 14.3.4, 14.3.5 and 14.3.6.

14.4.1.3 The amount of credit to be allowed by the Contractor to the City for any such change which results in a net decrease plus a deduction in the Contractor's fee by an amount equal to five percent (5%) for the net decrease.

14.4.1.4 When both additions and credits are involved in any one change the combined overhead and profit shall be figured on the basis of net increase if any, however, not to exceed five percent (5%) of the agreed compensation. Profit will not be paid on any Work not performed.

14.5 Cost Breakdown Required: Whenever the cost of any Work is to be determined pursuant to this Article, the Contractor will submit in form acceptable to the City an itemized cost breakdown together with supporting documentation. Whenever a change in the Work is to be based upon mutual acceptance of a lump sum, whether the amount is an addition, credit, or no-charge-in-cost, the Contractor shall submit an estimate substantiated by a complete itemized breakdown:

14.5.1 The breakdown shall list quantities and unit prices for materials, labor, equipment and other items of cost.

14.5.2 Whenever a change involves the Contractor and one (1) or more subcontractors and the change is an increase in the agreed compensation, the overhead and profit percentage for the Contractor and each subcontractor shall be itemized separately.

14.6 Time for the City to Approve Extra Work: Any Extra Work in an amount up to and not exceeding a cumulative amount of $25,000 for a specific project can be approved by the City Manager and shall require a written Change Order proposal to be submitted to the Public Works Director for submittal and approval by the City Manager. Extra Work exceeding the cumulative amount of $25,000 for a specific project must be approved by the City Commission and a written Change Order proposal must be submitted to the Public Works Director for submittal and approval by the City Manager and City Commission. No financial or time claim for delay to the project resulting from the Change Order approval process outlined above under Section 14.6 will be allowed.

ARTICLE 15 – CHANGE OF THE CONTRACT TIME

15.1 The Contract Time may only be changed by a Change Order. Any claim for an extension in the Contract Time shall be based on written notice delivered to the Project Manager within five (5) days of the occurrence of the event giving rise to the claim. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

15.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of the Contractor if a claim is made there for as provided in Paragraph 15.1. Such delays shall include but not be limited to, acts or neglect by the City, or to fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

15.3 All time limits stated in the Contract Documents are of the essence. The provisions of this Article 15 shall not exclude recovery for damages for delay by the Contractor.

15.4 Delays caused by or resulting from entities, contractors or subcontractors who are not affiliated with the CONTRACTOR (non-affiliated Contractors) shall not give rise to a claim by the CONTRACTOR for damages for increases in material and/or labor costs. Such entities, contractors and subcontractors include, but are not limited to, the City's contractors and subcontractors, Florida Power and Light Company, AT&T and Florida East Coast Railway, LLC.

15.5 Rights of Various Interests: Whenever work being done by City's forces or by other contractors is contiguous to or within the limits of work covered by this Contract, the respective rights of the various interests involved shall be established by the Project Manager to secure the completion of the various portions of the work in general harmony.

ARTICLE 16 – LIQUIDATED DAMAGES

16.1 Upon failure of the Contractor to complete the Work within the time specified for completion, the Contractor shall pay to the City the sum of **Two Hundred and Fifty Dollars ($250.00)** for each and every calendar day that the completion of the Work is delayed beyond the time specified in this Agreement for completion, as fixed and agreed liquidated damages and not as a penalty, so long as the delay is caused by the Contractor. Should an act of God or the acts or omissions of the City, its agents or representatives, in derogation to the terms of this Agreement cause the delay, the Contractor shall not be responsible for the delay nor liquidated damages. Liquidated damages are fixed and agreed upon between the Parties, recognizing the impossibility of precisely ascertaining the amount of damages that will be sustained by the City as a consequence of such delay and both parties desiring to obviate any question of dispute concerning the amount of damages and the cost and effect of the failure of the Contractor to complete the Work on time. Liquidated damages shall apply separately to each portion of the Work for which a time of completion is given. The City shall have the right to deduct from or retain any compensation which may be due or which may become due and payable to the Contractor the amount of liquidated damages, and if the amount retained by the City is insufficient to pay in full such liquidated damages, the Contractor shall pay all

liquidated damages in full. The Contractor shall be responsible for reimbursing the City, in addition to liquidated damages or other damages for delay, for all costs of engineering, architectural fees, and inspection and other costs incurred in administering the construction of the Project beyond the completion date specified or beyond an approved extension of time granted to the Contractor whichever is later. Delays caused by or resulting from entities, contractors or subcontractors who are not affiliated with the Contractor shall not give rise to a claim by Contractor for damages for increase in material and/or labor costs. Such entities, contractors and subcontractors include, but are not limited to, the City's contractors and subcontractors, Florida Power and Light Company, AT&T, and Florida East Coast Railway, LLC.

16.2 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any reason, allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

ARTICLE 17 – SUSPENSION OF WORK AND TERMINATION

17.1 City May Suspend Work: The City may, at any time and without cause, suspend the Work or any portion of the Work for a period of not more than ninety (90) days by notice in writing to the Contractor which shall fix the date on which Work shall be resumed. The Contractor shall resume the Work on the date fixed. The Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension, if the Contractor makes a claim as provided in Articles 14 and 15.

17.2 City's Right to Terminate Contract: The City may terminate this Agreement upon fifteen (15) calendar days' written notice upon the occurrence of any one or more of the following events:

17.2.1 If the Contractor commences a voluntary case or a petition is filed against the Contractor, under any chapter of the Bankruptcy Code, or if the Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency.

17.2.2 If the Contractor makes a general assignment for the benefit of creditors.

17.2.3 If a trustee, receiver, custodian or agent of the Contractor is appointed under applicable law or under Contract, whose appointment or authority to take charge of property of the Contractor is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the Contractor's creditors.

17.2.4 If Contractor fails to begin the Work within fifteen (15) calendar days after the Project Initiation Date, or fails to perform the Work with sufficient workers and equipment or with sufficient materials to ensure the prompt completion of the Work, or shall perform the Work unsuitably, or cause it to be rejected as defective and unsuitable, or shall discontinue the prosecution of the Work pursuant to the accepted schedule or if Contractor shall fail to perform any material term set forth in the Contract Documents, or from any other cause whatsoever shall not carry on the Work in an acceptable manner, Project Manager may give notice in writing to Contractor and its Surety of such delay, neglect or default, specifying the same.

17.2.5 If the Contractor repeatedly fails to make prompt payments to subcontractors or for labor, material or equipment.

17.2.6 If the Contractor repeatedly disregards proper safety procedures.

17.2.7 If the Contractor disregards any local, state or federal laws or regulations.

17.2.8 If the Contactor otherwise violates any provisions of this Agreement.

17.3 If Contractor, within a period of ten (10) calendar days after such notice, shall not proceed in accordance therewith, the City may exclude the Contractor from the Work site and take the prosecution of the Work out of the hands of the Contractor, and take possession of the Work and all of the Contractor's tools, appliances, construction equipment and machinery at the site and use them without liability to the City for trespass or conversion, incorporate in the Work all materials and equipment stored at the site or for which the City has paid the Contractor but which are stored elsewhere, and finish the Work as the City may deem expedient. In this instance, the Contractor shall not be entitled to receive any further compensation until the Work is finished.

17.3.1 If after notice of termination of Contractor's right to proceed, it is determined for any reason that Contractor was not in default, the rights and obligations of City and Contractor shall be the same as if the notice of termination had been issued pursuant to the Termination for Convenience clause as set forth in Section 17.5 below.

17.3.2 Upon receipt of Notice of Termination pursuant to Sections 17.2 or 17.5, Contractor shall promptly discontinue all affected work unless the Notice of Termination directs otherwise and deliver or otherwise make available to City all data, drawings, specifications, reports, estimates, summaries and such other information as may have been required by the Contract Documents whether completed or in process.

17.4 If the Contractor commits a default due to its insolvency or bankruptcy, the following shall apply:

17.4.1 Should this Agreement be entered into and fully executed by the parties, funds released and the Contractor (Debtor) files for bankruptcy, the following shall occur:

17.4.1.1 In the event the Contactor files a voluntary petition under 11 U.S.C. 301 or 302, or an order for relief is entered under 11 U.S.C. 303, the Contractor shall acknowledge the extent, validity, and priority of the lien recorded in favor of the City. The Contractor further agrees that in the event of this default, the City shall, at its option, be entitled to seek relief from the automatic stay pursuant to 11 U.S.C. 362. The City shall be entitled to relief from the automatic stay pursuant to 11 U.S.C. 362(d) (1) or (d) (2), and the Contactor agrees to waive the notice provisions in effect pursuant to 11 U.S.C. 362 and any applicable Local Rules of the United States Bankruptcy Court. The Contactor acknowledges that such waiver is done knowingly and voluntarily.

17.4.1.2 Alternatively, in the event the City does not seek stay relief, or if stay relief is denied, the City shall be entitled to monthly adequate protection payments within the meaning of 11 U.S.C. 361. The monthly adequate protection payments shall each be in an amount determined in accordance with the Note and Mortgage executed by the Contractor in favor of the City.

17.4.1.3 In the event the Contractor files for bankruptcy under Chapter 13 of Title 11, United States Code in additional to the foregoing provisions, the Contractor agrees to cure any amounts in arrears over a period not to exceed twenty-four (24) months from the date of the confirmation order, and such payments shall be made in addition to the regular monthly payments required by the Note and mortgage. Additionally, the Contractor shall agree that the City is over secured and, therefore, entitled to interest and attorney's fees pursuant to 11 U.S.C. 506(b). Such fees shall be allowed and payable as an administrative expense. Further, in the event the Contractor has less than five (5) years of payments remaining on the Note, the Contractor agrees that the treatment afforded to the claim of the City under any confirmed plan of reorganization shall provide that the remaining payments shall be satisfied in accordance with the Note, and that the remaining payments or claim shall not be extended or amortized over a longer period than the time remaining under the Note.

17.4.2 Should this Agreement be entered into and fully executed by the parties, and the funds have not been forwarded to Contractor, the following shall occur:

17.4.2.1 In the event the Contractor files a voluntary petition pursuant to 11 U.S.C. 301 or 302, or an order for relief is entered under 11 U.S.C. 303., the Contractor acknowledges that the commencement of a bankruptcy proceeding constitutes an event of default under the terms of this Agreement. Further, the Contractor acknowledges that this

Agreement constitutes an executory contract within the meaning of 11 U.S.C. 365. The Contractor acknowledges that this Agreement is not capable of being assumed pursuant to 11 U.S.C. 365(c)(2), unless the City expressly consents in writing to the assumption. In the event the City consents to the assumption, the Contractor agrees to file a motion to assume this Agreement within ten (10) days after receipt of written consent from the City, regardless of whether the bankruptcy proceeding is pending under Chapter 7, 11, or 13 of Title 11 of the United States Code. The Contractor further acknowledges that this Agreement is not capable of being assigned pursuant to 11 U.S.C. 365(b)(1).

17.5 Termination for Convenience: This Contract may be terminated for convenience in writing by City upon thirty (30) days written notice to Contractor (delivered by certified mail, return receipt requested) of intent to terminate and the date on which such termination becomes effective. In such case, Contractor shall be paid for all work executed and expenses incurred prior to termination in addition to termination settlement costs reasonably incurred by Contractor relating to commitments which had become firm prior to the termination. Payment shall include reasonable profit for work/services satisfactorily performed. No payment shall be made for profit for work/services which have not been performed.

17.6 Where the Contractor's service have been so terminated by the City, the termination shall not affect any rights of the City against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due the Contractor by the City will not release the Contractor from liability.

17.7 The Contractor has no right, authority or ability to terminate the Work except for the wrongful withholding of any payments due the Contractor from the City.

ARTICLE 18 – DISPUTE RESOLUTION

18.1 Resolution of Disputes: Questions, claims, difficulties and disputes of whatever nature which may arise relative to the technical interpretation of the Contract Documents and fulfillment of this Agreement as to the character, quality, amount and value of any work done and materials furnished, or proposed to be done or furnished under or, by reason of, the Contract Documents which cannot be resolved by mutual agreement of Contract Administrator and Contractor shall be submitted to the Consultant for resolution. When either party has determined that a disputed question, claim, difficulty or dispute is at an impasse, that party shall notify the other party in writing and submit the question, claim, difficulty or dispute to the Consultant for resolution. The parties may agree to a proposed resolution at any time without the involvement and determination of the Consultant.

18.1.1 Consultant shall notify Contract Administrator and Contractor in writing of Consultant's decision within twenty-one (21) calendar days from the date of the submission of the question, claim, difficulty or dispute, unless Consultant requires time to gather information or allow the parties to provide additional information.

18.1.2 In the event the determination of a dispute by the Consultant under this Article is unacceptable to any of the parties hereto, the party objecting to the determination must notify the other party and the City Manager, in writing within ten (10) days after receipt of the determination. The notice must state the basis of the objection and the proposed resolution. Final resolution of such dispute shall be made by the City Manager. The City Manager's decision shall be final and binding on the parties.

18.1.3 All non-technical administrative disputes (such as billing and payment) shall be determined by Contract Administrator.

18.1.4 During the pendency of any dispute and after a determination thereof, Contractor, Consultant, and Contract Administrator shall act in good faith to mitigate any potential damages including utilization of construction schedule changes and alternate means of construction. During the pendency of any dispute arising under this Agreement, other than termination herein, Contractor shall carry on the Work and adhere to the progress schedule. The Work shall not be delayed or postponed pending resolution of any disputes or disagreements.

18.1.5 For any disputes which remain unsolved, within sixty (60) calendar days after Final Completion of the Work, the parties shall participate in mediation to address all unresolved disputes. A mediator shall be mutually agreed upon by the parties. Should any objection not be resolved in mediation, the parties retain all their legal rights and remedies under applicable law. If a party objecting to a determination, fails to comply in strict accordance with the requirements of this Article, said party specifically waives all of its rights provided hereunder, including its rights and remedies under applicable law.

ARTICLE 19 – NOTICES

19.1 All notices required by any of the Contract Documents shall be in writing and shall be deemed delivered upon mailing by certified mail, return receipt requested to the following:

To the City:

City Manager
City of Fort Lauderdale
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

with copy to the:

Project Manager and City Attorney
City of Fort Lauderdale
100 North Andrews Avenue
Fort Lauderdale, Florida 33301

To the Contractor:

_____
_____
_____
_____

ARTICLE 20 – LIMITATION OF LIABILITY

20.1 The City desires to enter into this Agreement only if in so doing the City can place a limit on the City's liability for any cause of action arising out of this Agreement, so that the City's liability for any breach never exceeds the sum of $1,000. For other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Contractor expresses its willingness to enter into this Agreement with the knowledge that the Contractor's recovery from the City to any action or claim arising from the Agreement is limited to a maximum amount of $1,000, which amount shall be reduced by the amount actually paid by the City to the Contractor pursuant to this Agreement, for any action or claim arising out of this Agreement. Nothing contained in this paragraph or elsewhere in this Agreement is in any way intended either to be a waiver of the limitation placed upon the City's liability as set forth in Section 768.28, Florida Statutes, or to extend the City's liability beyond the limits established in said Section 768.28; and no claim or award against the City shall include attorney's fees, investigative costs, expert fees, suit costs or pre-judgment interest.

20.2 No Extended Damages: For other and additional good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the Contractor covenants and agrees that in the event of any delay of construction or for any reason, allegation or claim, and notwithstanding the reason of the delay, reason, claim or allegation or who caused them or the construction delay or whether they were caused by the City, that there will be no entitlement to Contractor to or for any direct or indirect financial damages or losses for extended corporate overhead impact, extended project overhead impacts, project support services, mobilization or demobilization or by whatever other label or legal concept or theory and types of names or labels or basis such claims may have, or any business damages or losses of whatever type or nature, and Contractor hereby waives any right to make any such claim or claims. This provision will have application and effect when construction delays are anticipated and agreed upon by both the City and the Contractor.

ARTICLE 21 – GOVERNING LAW

21.1 This Agreement shall be governed by the laws of the State of Florida. Both Parties agree that the courts of the State of Florida shall have jurisdiction of any claim arising in connection with this Agreement. Venue for any claim, objection or dispute arising out of this Agreement shall be in Broward County, Florida. **By entering into this Contract, Contractor and City hereby expressly waive any rights either party may have to a trial by jury or any civil litigation related to, or arising out of the Project. Contractor shall specifically bind all subcontractors to the provisions of this Contract.**

ARTICLE 22 – MISCELLANEOUS

22.1 The duties and obligations imposed by this Agreement and the rights and remedies available to the parties and, in particular but without limitation, the warranties, guaranties and obligations imposed upon the Contractor and all of the rights and remedies available to the City, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents, and the provisions of this Paragraph will survive final payment and termination or completion of this Agreement.

22.2 The Contractor shall not assign or transfer this Agreement or its rights, title or interests. The obligations undertaken by the Contractor pursuant to this Agreement shall not be delegated or assigned to any other person or firm. Violation of the terms of this Paragraph shall constitute a material breach of Agreement by the Contractor and the City any, at its discretion, cancel this Agreement and all rights, title and interest of the Contractor which shall immediately cease and terminate.

22.3 The Contractor and its employees, volunteers and agents shall be and remain an independent contractors and not agents or employees of the City with respect to all of the acts and services performed by and under the terms of this Agreement. This Agreement shall not in any way be constructed to create a partnership, association or any other kind of joint undertaking or venture between the Parties.

22.4 The City reserves the right to audit the records of the Contractor relating in any way to the Work to be performed pursuant to this Agreement at any time during the performance and term of this Agreement and for a period of three (3) years after completion and acceptance by the City. If required by the City, the Contractor agrees to submit to an audit by an independent certified public accountant selected by the City. The Contractor shall allow the City to inspect, examine and review the records of the Contractor at any and all times during normal business hours during the term of this Agreement.

22.5 The remedies expressly provided in this Agreement to the City shall not be deemed to be exclusive but shall be cumulative and in addition to all other remedies in favor of the City now or later existing at law or in equity.

22.6 Should any part, term or provisions of this Agreement be decided by the courts to be invalid, illegal or in conflict with any state or federal law, the validity of the remaining portion or provision shall not be affected.

22.7 Prohibition Against Contracting With Scrutinized Companies: Subject to *Odebrecht Construction, Inc., v. Prasad*, 876 F.Supp.2d 1305 (S.D. Fla. 2012), *affirmed*, *Odebrecht Construction, Inc., v. Secretary, Florida Department of Transportation*, 715 F.3d 1268 (11th Cir. 2013), with regard to the "Cuba Amendment," the Contractor certifies that it is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2016), that it is not engaged in a boycott of Israel, and that it does not

have business operations in Cuba or Syria, as provided in section 287.135, Florida Statutes (2016), as may be amended or revised. The City may terminate this Agreement at the City's option if the Contractor is found to have submitted a false certification as provided under subsection (5) of section 287.135, Florida Statutes (2016), as may be amended or revised, or been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2016), or is engaged in a boycott of Israel or has been engaged in business operations in Cuba or Syria, as defined in Section 287.135, Florida Statutes (2016), as may be amended or revised.

22.8 Public Entity Crimes: In accordance with the Public Crimes Act, Section 287.133, Florida Statutes, a person or affiliate who is a contractor, consultant or other provider, 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 the City, may not submit a bid on a contract with the City for the construction or repair of a public building or public work, may not submit bids on leases of real property to the City, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with the City, and may not transact any business with the City in excess of the threshold amount provided in Section 287.017, Florida Statutes, for category two purchases for a period of thirty-six (36) months from the date of being placed on the convicted vendor list. Violation of this section by Contractor shall result in cancellation of the City purchase and may result in Contractor debarment.

22.9 Attorney Fees: If CITY or CONSULTANT incurs any expense in enforcing the terms of this Agreement through litigation, the prevailing party in that litigation shall be reimbursed for all such costs and expenses, including but not limited to court costs, and reasonable attorney fees incurred during litigation.

22.10 Public Records

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT PRRCONTRACT@FORTLAUDERDALE.GOV, 954-828-5002, CITY CLERK'S OFFICE, 100 N. ANDREWS AVENUE, FORT LAUDERDALE, FLORIDA 33301.

Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service.

2. Upon request from the City's custodian of public records, provide the City with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes (2016), as may be amended or revised, or as otherwise provided by law.

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of this contract if the Contractor does not transfer the records to the City.

4. Upon completion of the Contract, transfer, at no cost, to the City all public records in possession of the Contractor or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of this Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of this Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.

Fire Station No. 2 HVAC Upgrades
(Contractor)
Project 12200 Re-Bid

CITY

IN WITNESS OF THE FOREGOING**,** the parties have set their hands and seals the day and year first above written.

CITY OF FORT LAUDERDALE, a municipal corporation of the State of Florida

By: _____
LEE R. FELDMAN, City Manager

(CORPORATE SEAL)

ATTEST:

By: _____
JEFFREY A. MODARELLI
City Clerk

Approved as to Legal Form:

By:_____
RHONDA MONTOYA HASAN
Assistant City Attorney

CONTRACTOR

WITNESSES:

CONTRACTOR.,
a Florida corporation.

_____ BY:_____

_____ _____ _____
Print Name PRINT NAME Title

_____ ATTEST:

_____ BY: _____
Print Name

_____ _____
PRINT NAME Secretary

(CORPORATE SEAL)

STATE OF FLORIDA:
COUNTY OF BROWARD:

The foregoing instrument was acknowledged before me this _____ day of _____, 2017, by _____ (Name), as _____ (Title) of _____ (CONTRACTOR), a Florida corporation, on behalf of the Corporation.

SEAL

_____
Notary Public, State of Florida

_____
Name of Notary Typed, Printed or Stamped

☐ Personally Known or ☐ Produced Identification:

Type of Identification Produced: _____

GENERAL CONDITIONS

Unless otherwise modified in the projects special conditions, the following General Conditions shall be part of the Contract:

GC - 01 - DEFINITIONS - The following words and expressions, or pronouns used in their stead, shall wherever they appear in the Contract and the Contract Documents, be construed as follows:

"Addendum" or "Addenda" - shall mean the additional Contract provisions issued in writing, by the Engineer, prior to the receipt of bids.

"Bid" – shall mean the offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

"Bidder" – shall mean any person, firm, company, corporation or entity submitting a Bid for the Work.

"Bonds" –shall mean Bid, performance and payment bonds and other instruments of security, furnished by Contractor and his surety in accordance with the Contract Documents.

“City” – shall mean the City of Fort Lauderdale, Florida, a Florida municipal corporation. In the event the City exercises its regulatory authority as a government body, the exercise of such regulatory authority and the enforcement of any rules, regulations, codes, laws and ordinances shall be deemed to have occurred pursuant to City’s authority as a governmental body and shall not be attributable in any manner to the City as a party to this Contract. For the purpose of this Contract, “City” without modification shall mean the City Commission, and/or City Manager or his/her designee(s) as applicable.

“Construction Manager” - shall mean the Public Works Director or his/her designee.

“Construction Project Manager” - shall mean the Public Works Director or his/her designee.

"Consultant" – shall mean a person, firm, company, corporation or other entity employed by the City to perform the professional services for the project.

“Contract Work” - shall mean everything expressed or implied to be required to be furnished and furnished by the Contractor by any one or more of the parts of the Contract Documents referred to in the Contract 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 Public Works Director shall determine which shall prevail.

“Design Documents” – shall mean the construction plans and specifications included as part of a Bid/Proposal Solicitation prepared either by the City or by the Consultant under a separate Agreement with the City.

“Engineer” - shall mean the Public Works Director or his/her designee.

"Extra Work" - shall mean work other than that required by the Contract.

"Inspector" – shall mean an authorized representative of the City assigned to make necessary inspections of materials furnished by Contractor and of the Work performed by Contractor.

"Notice" - shall mean written notice sent by certified United States Mail, return receipt requested, or sent by commercial express carrier with acknowledgement of delivery, or via fax or email, or by hand delivery with a request for a written receipt of acknowledgment of delivery and shall be served upon the Contractor either personally or to its place of business listed in the Bid.

“Owner” - shall mean the City of Fort Lauderdale.

“Project Manager” - shall mean the Public Works Director or his/her designee.

"Public Works Director" –shall mean the Public Works Director of the City of Fort Lauderdale, Florida or his/her designee(s).

"Site" - shall mean the area upon or in which the Contractor's operations are carried out and such other areas adjacent thereto as may be designated as such by the Public Works Director.

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

"Surety" - shall mean any corporation or entity that executes, as Surety, the Contractor's performance and payment bond securing the performance of this Contract.

GC - 02 - SITE INVESTIGATION AND REPRESENTATION - The Contractor acknowledges that it has satisfied itself as to the nature and location of the Work under the Contract Documents, the general and local conditions of the Site, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, and roads, the conformation and conditions at the ground based on City provided reports, the type of equipment and facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under the Contract Documents.

The Contractor acknowledges that it has conducted extensive tests, examinations and investigations and represents and warrants a thorough familiarization with the nature and extent of the Contract Documents, the Work, locality, soil conditions, moisture conditions and all year-round local weather and climate conditions (past and present), and, in reliance on such tests, examination and investigations conducted by Contractor and the Contractor’s experts, has determined that no conditions exist that would in any manner affect the Bid Price and that the project can be completed for the Bid Price submitted.

The Contractor, on its own, has made or caused to be made examinations, investigations, tests and studies of reports and related data in addition to those referred above, as Contractor deemed necessary to perform the Work at the Bid price set by the Contractor, within the contract time and in accordance with the other terms and conditions of the Contract Documents and the Bid made by the Contractor; and no additional examinations, investigations, tests, reports or similar data are, or will be, required by Contractor to assure that the Work can be done at the Bid price set by the Contractor.

The Contractor further acknowledges that it has satisfied itself based on any geotechnical reports the City may provide and inspection of the project Site as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site and from evaluating information derived from exploratory work that may have been done by the City or included in the

Contract Documents and finds and has further determined that no conditions exist that would in any manner affect the Bid price and that the project can be completed for the Bid price submitted.

Any failure by the Contractor to acquaint itself with all the provided information and information obtained by visiting the project Site will not relieve Contractor from responsibility for properly estimating the difficulty or cost thereof under the Contract Documents. In the event that the actual subsurface conditions vary from the actual City provided reports, the Contractor shall notify the City and the Contract amount may be adjusted depending on the conditions, at the approval of the City.

GC - 03 - SUBSTITUTIONS - If the Contractor desires to use materials and/or products of manufacturer's names different from those specified in the Contract Documents, the Bidder requesting the substitution shall make written application as described herein. The burden of proving the equality of the proposed substitution rests on the Bidder making the request. To be acceptable, the proposed substitution shall meet or exceed all expressed requirements of the Contract Documents and shall be submitted upon the Contractor's letterhead, in addition to the "Contractor's Request for Substitution" form provided by the Public Works Director. The following requirements shall be met in order for the substitution to be considered:

1. Requests for substitution shall reach the Public Works Director no less than ten (10) Working Days prior to the date set for opening of Bids; and

2. Requests for substitution shall be accompanied by such technical data, as the party making the request desires to submit. The Public Works Director will consider reports from reputable independent testing laboratories, verified experience records from previous users and other written information valid in the circumstances; and

3. Requests for substitution shall completely and clearly indicate in what respects the materials and/or products differ from those indicated in the Contract Documents; and

4. Requests for substitution shall be accompanied by the manufacturer's printed recommendations clearly describing the installation, use and care, as applicable, of the proposed substitutions; and

5. Requests for substitution shall be accompanied by a complete schedule of changes in the Contract Documents, if any, which must be made to permit the use of the proposed substitution.

If a proposed substitution is approved by the Public Works Director, an Addendum will be issued to prospective bidders not less than three (3) working days prior to the date set for opening of Bids. Unless substitutions are received and approved as described above, the successful Bidder shall be responsible for furnishing materials and products in strict accordance with the Contract Documents.

GC - 04 - CONTROL OF THE WORK - The Public Works Director shall have full control and direction of the Work in all respects. The Public Works Director and/or his authorized designee(s) shall, at all times, have the right to inspect the Work and materials. The Contractor shall furnish all reasonable facilities for obtaining such information, as the Public Works Director may desire respecting the quality of the Work and materials and the manner of conducting the Work. Should the Contractor be directed or permitted to perform night Work, or to vary the period which work is ordinarily carried on in the daytime, he shall give ample notice to the Public Works Director so that proper and adequate inspection may be provided. Such Work shall be done only under such regulations as are furnished in writing by the Public Works Director, and no extra compensation shall be allowed to the Contractor therefore. In the event of night work, the Contractor shall furnish

such light, satisfactory to the Public Works Director, as will insure proper inspection. Nothing herein contained shall relieve the Contractor from compliance with any and all City ordinances relating to noise or Work during prohibited hours.

The Contractor shall keep the Public Works Director informed, a reasonable time in advance, as to his need for grades and lines in order that the same may be furnished and all necessary measurements made for records and for payment with the minimum of inconvenience to the Public Works Director or of delay to the Contractor. The Contractor shall submit to the Public Works Director or Inspector on the job a written request outlining the streets, etc., for which the Contractor desires lines and grades. It is the intention not to delay the Work for the giving of lines and grades, but when necessary, work operations shall be suspended for such reasonable time as the Public Works Director may require for this purpose. However, such cost increases shall be authorized either by the City Manager and/or designee, or the City Commission based upon the purchasing threshold amounts provided for in Chapter 2 of the City of Fort Lauderdale's Code of Ordinances.

GC - 05 - SUBCONTRACTOR - The Contractor shall not sublet, in whole or any part of the Work without the written consent and approval of the Public Works Director. Within ten (10) days after official notification of starting date, the Contractor must submit in writing, to the Public Works Director, a list of all Subcontractors. No Work shall be done by any Subcontractor until such Subcontractor has been officially approved by the Public Works Director. A subcontractor not appearing on the original list will not be approved without written request submitted to the Public Works Director and approved by the Public Works Director. In all cases, the Contractor shall give his personal attention to the Work of the Subcontractors and the Subcontractor is liable to be discharged by the Contractor, at the direction of the Public Works Director, for neglect of duty, incompetence or misconduct.

Acceptance of any Subcontractor, other person, or organization by the Public Works Director shall not constitute a waiver of any right of Public Works Director to reject defective Work or Work not in conformance with the Contract Documents.

Contractor shall be fully responsible for all acts and omissions of his Subcontractors and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that he is responsible for the acts and omissions of persons directly employed by him. Nothing in the Contract Documents shall create any contractual relationship between City and any Subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of City to pay or to see to the payment of any moneys due to any Subcontractor or other person, or organization, except as may otherwise be required by law.

GC – 06 - **QUANTITIES** - It is mutually agreed that the proposal shows the approximate amounts only along with the Plans and the general location. It is also mutually agreed that no change will be made involving any departure from the general scheme of the Work and that no such change involving a material change in cost, either to the City or Contractor, shall be made, except upon written permission of the City. However, the Public Works Director shall have the right to make minor alternations in the line, grade, plan, form or materials of the Work herein contemplated any time before the completion of the same. That if such alterations shall diminish the quantity of the Work to be done, such alterations shall not constitute a claim for damages or anticipated profits. That if such alterations increase the amount of the Work to be done, such increase shall be paid for according to the quantity actually performed and at the unit price or prices stipulated therefore in the Contract.

The City shall, in all cases of dispute, determine the amount or quantity of the several kinds of Work which are to be paid for under this Contract, and shall decide all questions relative to the execution of the same, and such estimates and decisions shall be final and binding.

Any Work not herein specified, which might be fairly implied as included in the Contract, of which the City shall judge, shall be done by the Contractor without extra charge. However, such cost increases shall be authorized either by the City Manager and/or designee, or the City Commission based upon the purchasing threshold amounts provided for in Chapter 2 of the City of Fort Lauderdale's Code of Ordinances.

GC–07 - NO ORAL CHANGES - Except to the extent expressly set forth in the Contract, no change in or modification, termination or discharge of the Contract in any form whatsoever, shall be valid or enforceable unless it is in writing and signed by the parties charged, therewith or their duly authorized representative.

GC - 08 - PERMITS AND PROTECTION OF PUBLIC – Permits on file with the City and or those permits to be obtained shall be considered directive in nature and will be considered a part of this Contract. A copy of all permits shall be given to the City and become part of the Contract Documents. Terms of permits shall be met prior to acceptance of the Work and release of the final payment.

The Contractor shall be required to observe all the ordinances in relation to obtaining permits for occupying, excavating, or in any way obstructing the streets and alleys. He shall erect and maintain barricades and sufficient safeguards around all excavations, embankments or obstructions; he shall place sufficient warning lights at or near the Work; keep the same burning from sunset to sunrise, employ watchmen, and strictly obey all laws and ordinances controlling or limiting those engaged in similar work.

Where there are telephones, light or power poles, water mains, conduits, pipes or drains or other construction, either public or private, in or on the streets or alleys, the Work shall be so conducted that no interruption or delay will be caused in the operation or use of the same. Proper written notice shall be given, and all the facilities, afforded the owners of such construction encountered or likely to be encountered, as will enable them to preserve the same from injury.

The Contractor shall not be permitted to interfere with public travel and convenience by grading or tearing up streets indiscriminately, but the Work of constructing the various items in this contract shall proceed in an orderly, systematic and progressive manner.

Contractor shall not load nor permit any part of any structure to be loaded with weights that will endanger the structure, nor shall he subject any part of the Work to stresses or pressures that will endanger it.

Where lifting operations involving the use of specialized cranes are required as part of construction, Contractor must make undertake the following investigation and submit the results and documentation to the Engineer prior to commencing any lifting operations: marking a very specific area in the field for the placement of the crane; a drawing showing the limitations of the job operation (i.e. not over adjacent properties or pedestrian and high vehicular traffic areas);underground utility exploration in the vicinity of the crane location, which may include ground penetrating radar to identify voids or old pipe or other subsurface features that could lead to sudden failure; assessment of the underlying soil and roadway materials and a worst case analysis based on entire load being distributed on just one or two outriggers; provision of properly sized pads under the outriggers; loading charts from manufacturer showing allowable configurations/loads; and inspection to make sure crane operation is in accordance with the permit conditions.

GC - 09 - DISEASE REGULATIONS - The Contractor shall enforce all sanitary regulations and take all precautions against infectious diseases as the Public Works Director may deem necessary. Should any infectious or contagious diseases occur among his employees, he shall arrange for the immediate removal of the employee from the Site and isolation of all persons connected with the Work.

GC - 10 - CONTRACTOR TO CHECK PLANS, SPECIFICATIONS, AND DATA - The Contractor shall verify all dimensions, quantities, and details shown on the plans, supplementary drawings, schedules, or other data received from the Public Works Director, and shall notify the Public Works Director of all errors, omissions, conflicts and discrepancies found therein within three (3) working days of discovery. Failure to discover or correct errors, conflictions, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction, or improper operation resulting there from nor from rectifying such condition at his own expense.

GC - 11 - SUPPLEMENTARY DRAWINGS - When, in the opinion of the Public Works Director, 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 Public Works Director and copies will be given to the Contractor.

The supplementary drawings shall be binding upon the Contractor with the same force as the original Plans. Where such supplementary drawings require either less or more than the estimated quantities of work, credit to the City or compensations therefore to the Contractor shall be subject to the terms of the Contract.

GC - 12 - MATERIALS AND WORKMANSHIP - All material and workmanship shall, in every respect, be in conformity with approved modern practice and with prevailing standards of performance and quality. In the event of dispute the Public Works Director's decision shall be final. Wherever the Plans, specifications, Contract Documents, or the directions of the Public Works Director are unclear as to what is permissible and/or fail to note the quality of any Work, that interpretation will be made by the Public Works Director, which is in accordance with approved modern practice, to meet the particular requirements of the Contract.

In all cases, new materials shall be used, unless this provision is waived by notice from the City in writing.

GC - 13 - 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 re-establishing same if disturbed, or bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting or for removing without authorization, such established points, stakes and marks. The Contractor shall safeguard all existing and known property corners, monuments and marks not related to the Work and, if required, shall bear the cost of having them re-established by a licensed surveyor if disturbed or destroyed during the course of construction.

GC - 14 - EXISTING UTILITY SERVICE - All existing utility service shall be maintained with a minimum of interruption at the expense of the Contractor.

GC - 15 - JOB DESCRIPTION SIGNS – Contractor, at Contractor's expense, shall furnish, erect, and maintain suitable weatherproof signs on jobs over $100,000 containing the following information:

1. City Seal (in colors)
2. Project or Improvement Number
3. Job Description

4. Estimated Cost
5. Completion Date

Minimum size of sign shall be four feet high, eight feet wide and shall be suitably anchored. The entire sign shall be painted and present a pleasing appearance. Exact location of signs will be determined in the field. Two (2) signs will be required, one at each end of the job. All costs of this work shall be included in other parts of the work.

GC - 16 - FLORIDA EAST COAST RIGHT-OF-WAY - Whenever a City contractor is constructing within the Florida East Coast Railway Company's Right-of-Way, it will be mandatory that the contractor carry separate bodily injury and property damage insurance in the amounts as stated below. This insurance shall be taken out and maintained during the life of the Contract.

Bodily injury insurance in an amount not less than $500,000.00 for injuries, including wrongful death to any one person, and subject to the same limit for each person, in an amount not less than $1,000,000.00 on account of any one occurrence, and

Property damage insurance in an amount not less than $500,000.00 for damages on account of any one occurrence and in an amount not less than $1,000,000.00 for damages on account of all occurrences.

GC - 17 - ACCIDENTS - The Contractor shall provide such equipment and facilities as are necessary and/or required, in the case of accidents, for first aide services to be provided to a person who may be injured during the project duration. The Contractor shall also comply with the OSHA requirements as defined in the United States Labor Code 29 CFR 1926.50.

In addition, the Contractor must report immediately to the Public Works Director every accident to persons or damage to property, and shall furnish in writing full information, including testimony of witnesses regarding any and all accidents.

GC - 18 - SAFETY PRECAUTIONS - Contractor must adhere to the applicable environmental protection guidelines for the duration of a project. If hazardous waste materials are used, detected or generated at any time, the Project Manager must be immediately notified of each and every occurrence. The Contractor shall comply with all codes, ordinances, rules, orders and other legal requirements of public authorities (including OSHA, EPA, DERM, the City, Broward County, State of Florida, and Florida Building Code), which bear on the performance of the Work.

The Contractor shall take the responsibility to ensure that all Work is performed using adequate safeguards, including but not limited to: proper safe rigging, safety nets, fencing, scaffolding, barricades, chain link fencing, railings, barricades, steel plates, safety lights, and ladders that are necessary for the protection of its employees, as well as the public and City employees. All riggings and scaffolding shall be constructed with good sound materials, of adequate dimensions for their intended use, and substantially braced, tied or secured to ensure absolute safety for those required to use it, as well as those in the vicinity. All riggings, scaffolding, platforms, equipment guards, trenching, shoring, ladders and similar actions or equipment shall be OSHA approved, as applicable, and in accordance with all Federal, State and local regulations.

GC - 19 - DUST PREVENTION - The Contractor shall, by means of a water spray, or temporary asphalt pavement, take all necessary precautions to prevent or abate a dust nuisance arising from dry weather or Work in an incomplete stage. All costs of this Work shall be included in cost of other parts of the Work.

Should the Contractor fail to abate a dust nuisance by the above methods, and then he will be required to immediately construct temporary patches per City standards.

GC - 20 - PLACING BARRICADES AND WARNING LIGHTS - The Contractor shall furnish and place, at his own expense, all barricades, warning lights, automatic blinker lights and such devices necessary to properly protect the work and vehicular and pedestrian traffic. Should the Contractor fail to erect or maintain such barricades, warning lights, etc., the Public Works Director may, after 24 hours' notice to the Contractor, proceed to have such barricades and warning lights placed and maintained by City or other forces and all costs incurred thereof charged to the Contractor and may be retained by the City from any monies due, or to become due, to the Contractor.

GC - 21 - TRAFFIC CONTROL - The Contractor shall coordinate all Work and obtain, through the City's Transportation and Mobility Department, Broward County, Florida Department of Transportation, as applicable, any permits required to detour traffic or close any street before starting to work in the road. The following section: Part VI Traffic Controls for Street and Highway Construction and Maintenance Operations, MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, U.S. Department of Transportation Federal Highway Administration, 2009, or current edition, shall be used as a guide for requirement and placement of traffic control devices, signs and barricades. The Public Works Director shall determine requirements for the above. The above publication is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. In the event that a Maintenance of Traffic (MOT) Plan is required, the Plan shall be prepared by an A.A.S.T.A. certified technician.

All traffic control devices, flashing lights, signs and barricades shall be maintained in working condition at all times.

GC - 22 - COORDINATION - The Contractor shall notify all utilities, transportation department, etc., in writing, with a copy to the Public Works Director before construction is started and shall coordinate his Work with them. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal, construction and rearrangement operations in order that services rendered by these parties will not be unnecessarily interrupted.

The Contractor shall arrange his Work and dispose of his materials so as to not interfere with the operation of other Contractors engaged upon adjacent work and to join his Work to that of others in a proper manner and to perform his Work in the proper sequence in relation to that of other Contractors all as may be directed by the Public Works Director.

Each Contractor shall be responsible for any damage done by him or his agents to the work performed by another Contractor.

The Contractor shall contact the Broward County Transportation Department and the Florida Department of Transportation, as applicable, to verify and obtain location of any and all traffic conduits, loops, and street light underground services.

GC - 23 - WATER - Bulk water used for construction, flushing pipelines, and testing shall be obtained from fire hydrants. Contractor shall make payment for hydrant meter at Treasury Billing Office, 1st Floor, City Hall, 100 N. Andrews Avenue. With the paid receipt, contractor can pick up hydrant meter at the utility location office. No connection shall be made to a fire hydrant without a meter connected.

GC - 24 - PROHIBITION AGAINST CONTRACTING WITH SCRUTINIZED COMPANIES - Subject to *Odebrecht Construction, Inc., v. Prasad*, 876 F.Supp.2d 1305 (S.D. Fla. 2012), *affirmed*, *Odebrecht Construction, Inc., v. Secretary, Florida Department of Transportation*, 715 F.3d 1268 (11th Cir. 2013), with regard to the "Cuba Amendment," the Contractor certifies that it is not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2016), that it is not engaged in a boycott

of Israel, and that it does not have business operations in Cuba or Syria, as provided in section 287.135, Florida Statutes (2016), as may be amended or revised. The City may terminate this Agreement at the City's option if the Contractor is found to have submitted a false certification as provided under subsection (5) of section 287.135, Florida Statutes (2016), as may be amended or revised, or been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List or the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2016), or is engaged in a boycott of Israel or has been engaged in business operations in Cuba or Syria, as defined in Section 287.135, Florida Statutes (2016), as may be amended or revised.

GC - 25 - LOCATION OF UNDERGROUND FACILITIES - If the Proposer, for the purpose of responding to this solicitation, requests the location of underground facilities through the Sunshine State One-Call of Florida, Inc. notification system or through any person or entity providing a facility locating service, and underground facilities are marked with paint, stakes or other markings within the City pursuant to such a request, then the Proposer shall be deemed non-responsive to this solicitation in accordance with Section 2-184(5) of the City of Fort Lauderdale Code of Ordinances.

GC - 26 – USE OF FLORIDA LUMBER TIMBER AND OTHER FOREST PRODUCTS - In accordance with Florida Statute 255.20 (3), The City specifies that lumber, timber, and other forest products used for this project shall be produced and manufactured in the state of Florida if such products are available and their price, fitness, and quality are equal. This requirement does not apply to plywood specified for monolithic concrete forms, if the structural or service requirements for timber for a particular job cannot be supplied by native species, or if the construction is financed in whole or in part from federal funds with the requirement that there be no restrictions as to species or place of manufacture.

The Bidder affirms by submitting a bid response to this solicitation that they will comply with section 255.20 (3) Florida Statutes.

GC – 27 – PUBLIC RECORDS/TRADE SECRETS/COPYRIGHT: The Proposer's response to the Solicitation is a public record pursuant to Florida law, which is subject to disclosure by the City under the State of Florida Public Records Law, Florida Statutes Chapter 119.07 ("Public Records Law"). The City shall permit public access to all documents, papers, letters or other material submitted in connection with this Solicitation and the Contract to be executed for this Solicitation, subject to the provisions of Chapter 119.07 of the Florida Statutes.

Any language contained in the Proposer's response to the Solicitation purporting to require confidentiality of any portion of the Proposer's response to the Solicitation, except to the extent that certain information is in the City's opinion a Trade Secret pursuant to Florida law, shall be void. If a Proposer submits any documents or other information to the City which the Proposer claims is Trade Secret information and exempt from Florida Statutes Chapter 119.07 ("Public Records Laws"), the Proposer shall clearly designate that it is a Trade Secret and that it is asserting that the document or information is exempt. The Proposer must specifically identify the exemption being claimed under Florida Statutes 119.07. The City shall be the final arbiter of whether any information contained in the Proposer's response to the Solicitation constitutes a Trade Secret. The City's determination of whether an exemption applies shall be final, and the proposer agrees to defend, indemnify, and hold harmless the City and the City's officers, employees, and agent, against any loss or damages incurred by any person or entity as a result of the City's treatment of records as public records. Proposals purporting to be subject to copyright protection in full or in part will be rejected.

EXCEPT FOR CLEARLY MARKED PORTIONS THAT ARE BONA FIDE TRADE SECRETS PURSUANT TO FLORIDA LAW, DO NOT MARK YOUR RESPONSE TO THE SOLICITATION

AS PROPRIETARY OR CONFIDENTIAL. DO NOT MARK YOUR RESPONSE TO THE SOLICITATION OR ANY PART THEREOF AS COPYRIGHTED.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

Telephone Number: **(954) 828-5002**

Mailing Address: **City Clerk's Office**
100 N. Andrews Avenue
Fort Lauderdale, FL 33301

E-mail: **prrcontract@fortlauderdale.gov**

Contractor shall:

1. Keep and maintain public records that ordinarily and necessarily would be required by the City in order to perform the service.

2. Upon request from the City's custodian of public records, provide the City with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes (2016), as may be amended or revised, or as otherwise provided by law.

3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of this contract if the Contractor does not transfer the records to the City.

4. Upon completion of the Contract, transfer, at no cost, to the City all public records in possession of the Contractor or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of this Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of this Contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.

SECTION 011200
SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 SPECIAL CONDITIONS

A. This renovations project will be done in phases. The contractor will coordinate with fire personnel and arrange for working areas, parking, staging and schedules so as not to interfere with daily operations. This is an active Fire Station as well as administration offices on the upper floor, thus all work shall be done around their operations with minimal disruption and extensive coordination. The contractor shall give Owner 5 days' notice indicating all upcoming planned work. A phasing plan by Contractor indicating scope and timeframe for each area of work shall be supplied and updated regularly as project proceeds. The contractor shall give a 2 week look-ahead for all work on said 5 day notices. A weekly meeting to review the 2 week look-ahead shall be held on site.

B. The City of Fort Lauderdale brings to the Contractors attention that this project is in our Fire Station number 2, which is in operation. Areas of the fire station will be closed to the contractor at certain times. Contractor shall coordinate all access with the City in advance. Contractor shall be responsible for coordination and notification of areas to be worked on.

C. Contractor is responsible for the demolition and/or relocation of existing equipment and ducts as necessary for the performance of the Work.

D. Contractor to prepare provide As-Built drawings after renovation is completed.

1.2 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the construction site during normal business working hours of 7:30 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated. Also, contractor must be aware of both residential and commercial surroundings (traffic and operations). Contractor shall coordinate with the City of Fort Lauderdale the timing and scheduling of on-site inspections for this project. The Contractor's foreman will be given an access card by the Owner and it will be that person's responsibility to escort workers to and from the work area daily. Workers can only enter or exit the facility and designated work areas with the foreman.

B. DEFINITIONS:
A. Work Hours: 7:30 AM through 4:00 PM, Monday through Friday.
B. Business Hours: 8:30 AM through 5:00 PM, Monday through Friday.
C. Off-Hours: Hours outside of Work Hours defined above.
D. Early morning Hours: 7:00 AM through 8:30 AM, Monday through Friday.

C. Contractor's staging area is strictly limited to areas indicated on the drawings. Where no staging area is indicated, Contractor's use of site is limited to areas within the Contract bounds, or as reasonably required to complete the Work. Strictly comply with Owner's Representative's directions establishing staging and operation areas, through-building routes, and locations for material delivery and disposal. Staging areas for this project is severely limited and coordination with Owner extremely critical.

D. Contractor's personnel are prohibited from using toilets facilities during construction. Provide temporary toilet facilities for construction personnel. Coordinate location with Owner's representative.

E. Parking for contractor's personnel shall be arranged by Owner's representative and contractor's personnel shall make sure their vehicles do not in any away affect normal operations at any time. The owner will try to accommodate parking during the project, but parking is not guaranteed.

F. The contractor shall be responsible for supplying temporary cooling and air conditioning during phases of the work that will take the system or part of the system for more than 2 hours or indoor temperatures higher than 75 degrees.

G. A. Schedule work with Owner to fit Owner's operations, to facilitate completion of this work, to coordinate with and expedite new construction work on project, and as follows:

Contractor shall schedule with Owner work that interferes with facility operation, including shut-off of mechanical and electrical services and encumbrance of Owner's ingress and egress routes and normal operation. Provide the following notice of planned interruption of services:

1.4 WORK SEQUENCE

A. Work Sequence (Phasing): Conduct the Project in phases to provide the least possible interference to activities of the Owner's personnel, and to permit the orderly transfer of personnel and equipment to the renovated facilities. The building in which Project is located will be continuously occupied during construction. Coordinate construction efforts with Owner to minimize interference with Owner's operations.

1. Achieve Substantial Completion (ready for Owner's occupancy) in one room before beginning work in the next.

B. Notify Owner's Representative 7 calendar days prior to scheduled date of Substantial Completion of each phase of the Project. Before beginning successive phases of Work, comply with the following requirements:

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011200

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:
   1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
   2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or City that are not required in order to meet other Project requirements but may offer advantage to the City either in terms of time or cost.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   1. Substitution Request Form: Use CSI Form 13.1A.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with Florida Building Code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.
c. No substitutions will be allowed after bidding unless requested by the City.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 10 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
    c. Substitution request is fully documented and properly submitted.
    d. Requested substitution will not adversely affect Contractor's construction schedule.
    e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    f. Requested substitution is compatible with other portions of the Work.
    g. Requested substitution has been coordinated with other portions of the Work.
    h. Requested substitution provides specified warranty.
    i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will only consider requests for substitution if received within 7 days after the Notice to the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

   a. City’s Form - Periodic Estimate for Partial Payment.
   b. Submittals Schedule.
   c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to City Representative at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Project Number
   c. Contractor's name and address.
   d. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.

      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration, documentation and training in the amount of 5 percent of the Contract Sum.

   a. As part of the Schedule of Values the Contractor shall include LEED provision breakdown as part of the work completed as a separate line item.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost,

multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as General Conditions expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. The General Contractor must meet with the City Representative on or about the 25th of each month. The City Representative will go over the pay items and agree on the quantities and the dollar amounts of the work completed during the month. A copy of the agreed amounts will be signed by the parties and a copy will be left with each representative.

B. The General Contractor will make up a partial pay request using the City-supplied forms and submit the request to the City Representative before the first of the upcoming month.

C. LEED compliance sections will be part of the application for payment process and the contractor will be required to prove that the LEED requirements have been fulfilled, in writing, before the application can be processed. The actual written statement and certification format will be determined by the LEED consultant and added to the applications. These certifications will be tied to the LEED phasing of the project as determined by the LEED consultant. This process shall occur for all applications including the Final Application. Any retainage shall be held until all LEED requirements by the Contractor have been met.

D. Each pay request must be accompanied by a partial release of lien by the General Contractor and by all Subcontractors, suppliers, and for all labor, as outlined below.

    1. Starting with the second (2nd) pay request and for each and every pay request thereafter, the General Contractor shall submit partial release of liens from all Subcontractors, suppliers, and laborers covering the preceding month's request (SEE FOLLOWING EXAMPLE).
    2. EXAMPLE: In the first (1st) pay request, payment is requested by General Contractor for the asbestos contractor and the electrician. The General Contractor must attach his partial release of lien.
    3. For the second (2nd) pay request, the General Contractor must attach his partial release of lien from the asbestos contractor and the electrician for the amounts billed in the 1st pay request; i.e., the General Contractor will be running one (1) month behind with the releases from the Subcontractors, suppliers, etc., until the final pay request.

E. For the final pay request, the General Contractor will be required to submit FINAL release of liens for ALL Subcontractors, suppliers, etc., and for ALL labor BEFORE FINAL PAYMENT WILL BE MADE.

F. No partial payments, after the first payment, will be made until all partial release of liens are

submitted for the preceding month's billing, as described.

G. Each Application for Payment shall be consistent with previous applications and payments as certified by and paid for by City.

H. Payment Application Forms: Use City Form "PERIODIC ESTIMATE FOR PARTIAL PAYMENT" as form for Applications for Payment.

1. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. City will return incomplete applications without action.
2. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

I. Release of Lien: With each Application for Payment, submit release of lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial release of lien on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final release of lien.
3. City reserves the right to designate which entities involved in the Work must submit release of lien forms.

J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire City's insurance.
16. Initial settlement survey and damage report if required.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof

that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.
4. Evidence that claims have been settled.
5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when City took possession of and assumed responsibility for corresponding elements of the Work.
6. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination
2. Special Project Procedures
3. Administrative and supervisory personnel
4. Project meetings
5. Requests for Interpretation (RFIs)

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections include the following:

1. Division 01 Section "Summary of Multiple Contracts" for a description of the division of Work among separate contracts and responsibility for coordination activities not in this Section.
2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
3. Division 01 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for City and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.5 SUBMITTALS

A. Key Personnel Names: Within 15 days of notice to proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 SPECIAL PROJECT PROCEDURES

A. Discrepancies, Errors: Should discrepancies or errors appear in the drawings or specifications concerning materials, workmanship, or quantity of work to be performed, the Contractor will be required to immediately notify the City before proceeding with the work. If the Contractor fails to notify the City and proceeds with the work, Contractor will be required to correct the errors at his/her own expense. In the event of a conflict between the drawings and specifications, the City will decide on the way to perform the work or supply the materials. See also General Conditions Section GC-29, "Contractor to Check Plans Specifications, and Data."

B. Dimensions and Measurements: The figured dimensions on the drawings or notes including dimensions shall be used for construction instead of measurements of the drawings by scale. No scale measurements shall be used as a dimension for construction. Dimensions on all

drawings as well as the detail drawings themselves are subject in every case to measurements of adjacent or previously completed work. All such measurements necessary shall be taken before undertaking any work dependent upon such data. Field verification of dimensions on plans is mandatory since actual locations, distances, and levels will be governed by actual field conditions.

C. Discrepancies or Inconsistencies: Should any discrepancy or inconsistency appear between larger and smaller scale drawings in any of the divisions of the specifications or in any of the contract documents, such discrepancy shall be immediately submitted to the City for correction before proceeding with the work in question. In no case shall the Contractor make any alterations, erasures, changes or modifications in the drawings or specifications.

1. Should it appear that any of the work as specified or shown by the drawings is not sufficiently detailed or explained, the Contractor shall apply to the City for such further details or information as may be necessary for full understanding of the work in question.
2. The data set forth in these specifications and indicated on the drawings are as accurate as can be obtained, but their extreme accuracy is not guaranteed. Final application thereto shall be determined on the job as conditions may demand and subject to the approval of the City.

D. Plans and Specifications Acknowledgment by Subcontractors and Suppliers: All Subcontractors and suppliers must submit, through the General Contractor to the City Engineer, a statement on their individual letterhead stationary, signed and sealed with their corporate seal, or a notarized statement on their letterhead stationery in the absence of a corporate seal, that the individual Subcontractor or Supplier:

1. Has received or reviewed a FULL set of approved plans and specifications for the project,
2. Is aware that items concerning their particular trade may be shown and/or detailed in other trades or sections of the plans and specifications, and
3. Will comply with said plans, specifications and all applicable codes and permit requirements.

E. In the event a Subcontractor or Supplier notes a mistake or details appear incomplete, or if there are questions or concerns with the plans and specifications, the Subcontractor or Supplier will immediately notify the General Contractor. No work will proceed until such conflicts or questions are resolved in writing.

F. The Subcontractor will not be permitted to start work, nor will any Shop drawings/submittals be accepted for review from a supplier until this letter of acknowledgment is received and approved by the General Contractor and City Engineer. Also, the City will not process any pay request for the work of any Subcontractor or Supplier whose acknowledgment letter is not on file with the City.

1.7 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. The Contractor shall employ a competent superintendent who can communicate with spoken English, and who shall be in attendance at the site full-time when any work is in progress. The superintendent shall be satisfactory to the City's Engineer and shall not be changed except with the consent of the City's Engineer.

B. General: In addition to Project superintendent, provide other administrative and supervisory

personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.8 PROJECT MEETINGS

A. General: Attend meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
2. Minutes: Record of significant discussions and agreements achieved.

    a. Minutes from all meetings shall be prepared by the City, reflecting all items discussed as well as agreed upon or suggested solutions. These minutes shall be a true reflection of what actually happened at the meeting.
    b. Items discussed and not resolved or being handled by any one of the parties present shall be reflected along with the name of the person responsible in all ongoing minutes until it is resolved.
    c. Minutes shall be typewritten within 24 hours from the completion of the meeting. They shall immediately be emailed to all parties present.
    d. All items requiring information and not resolved shall be reflected in each and every set of minutes thereafter until it is totally resolved

B. Preconstruction Meeting: After the contract(s) has been awarded, executed, and a tentative work schedule has been composed, and prior to the start of the work, the Contractor(s), the Architect, the City's Representative, and other persons and/or governmental agencies that are involved shall meet. The minimum agenda is to include but is not limited to the following:

1. Distribute and discuss list of major Subcontractors
2. Tentative construction schedule
3. Phasing
4. Critical work sequencing and long-lead items
5. Relation and coordination of Prime Contractor
6. Designation of key personnel and their duties
7. Procedures for processing field decisions and Change Orders
8. Procedures for RFIs
9. Procedures for testing and inspecting
10. Adequacy of distribution of contract documents
11. Submittal of Shop drawings, project data, and samples
12. LEED requirements
13. Procedures for maintaining Record documents
14. Use of premises
15. Protection of existing construction including landscape materials
16. Work restrictions
17. City's occupancy requirements
18. Responsibility for temporary facilities and controls
19. Major equipment deliveries and priorities
20. Construction waste management and recycling
21. Parking availability
22. Working hours
23. Safety and first-aid procedures
24. Security procedures
25. Housekeeping procedures including progress cleaning.

26. Schedule of values.
27. Processing of payments or contract.
28. DHS Security Requirements

C. Progress Meetings: Progress meetings shall be held at bi-weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of City and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Review and approve minutes of previous Progress Meeting.
b. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Contractor shall submit a two-week look ahead schedule for review at each progress meeting.

1) Review schedule for next period.

c. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: City shall record the meeting minutes. These minutes shall indicate all items discussed as well as agreed upon or suggested solutions. They shall be a true reflection of what occurred at the meeting.
4. Reporting: Within 24 hours, distribute minutes of the meeting by email to each party present and to parties who should have been present.

    a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.9 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. City Project Number
2. City Project Name.
3. Date.
4. Name of Contractor.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: Form at end of this Section.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above. Word Template is available upon request from the City Engineer’s Office.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it.

Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. RFI number including RFIs that were dropped and not submitted.
4. RFI description.
5. Date the RFI was submitted.
6. Date Architect's response was received.
7. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
8. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Submittals Schedule.
2. Daily construction reports.
3. Material location reports.
4. Field condition reports.
5. Special reports.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Photographic Documentation" for submitting construction photographs.
5. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical Path Method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either City or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Contractor's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

C. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

D. Daily Construction Reports: Submit two copies at monthly intervals.

E. Material Location Reports: Submit two copies at monthly intervals.

F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

G. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Personnel Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early

because of long lead time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. The schedule shall clearly indicate the critical path and all activities associated with it. The dependencies shall be clearly delineated.
2. All activities with a time duration exceeding five (5) days shall be shown as separate items.
3. Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Where materials require more than one (1) week fabrication or order time, this order/fabrication time shall be shown.
5. Include not less than 3 days for startup and testing.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by City: Include a separate activity for each portion of the Work performed by City.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. City-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.

d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Startup and placement into final use and operation.

8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

   a. Structural completion.
   b. Permanent space enclosure.
   c. Completion of mechanical installation.
   d. Completion of electrical installation.
   e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Final Completion, and Certificate of Occupancy.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.

2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
3. Each activity cost shall reflect an accurate value subject to approval by Architect.

4. Total cost assigned to activities shall equal the total Contract Sum.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Microsoft Project 2007 for Windows operating system.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 7 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and

relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by City that may affect or be affected by Contractor's activities.
i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Emergency procedures.
11. Orders and requests of authorities having jurisdiction.
12. Change Orders received and implemented.
13. Construction Change Directives received and implemented.
14. Services connected and disconnected.
15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to City within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise City in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: City may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, City Representative, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Time lapse photographs.
4. Final Completion construction photographs.

B. Related Sections include the following:
1. Division 01 Section "Submittal Procedures" for submitting photographic documentation.
2. Division 01 Section "Closeout Procedures" for submitting digital media and construction videotapes as Project Record Documents at Project closeout.

1.3 SUBMITTALS

A. Construction Photographs: Submit digital media files of each photographic view within seven days of taking photographs.

1. Format: Compact Disc(s) with jpg format, uncropped unedited photograph files numbered by date taken. File names shall be in the following format: City project number – date taken – picture number (example: 10350-040804-011 would indicate project number 10350 taken on April 8, 2004 photograph number 11). Submit in CD jewel case.
2. Identification: On jewel case and CD, provide an applied label with the following information:

a. Name of Project.
b. Name of Contractor.
c. Dates photographs were taken.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in highest quality JPEG format produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Aerial Photographer: Engage a qualified commercial aerial photographer to take aerial construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Daily Progress Photographs: Take daily photographs to document progress. Take photographs of all work that will be concealed by subsequent construction activity (such as rough electrical, rough plumbing and rough ductwork). Such photographs shall fully document actual installed conditions.

D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.

E. Preconstruction Photographs: Before starting construction, take color photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas and construction limits before taking construction photographs.
2. Take eight photographs to show existing conditions adjacent to property before starting the Work.
3. Take eight photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

F. Periodic Construction Photographs: Take minimum 15, digital photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points, including aerial photographs to show status of construction and progress since last photographs were taken.

G. Time-Lapse Sequence Construction Photographs: Take daily, digital photographs to show

status of construction and progress. Contractor to submit digital photographs on CD with each application for payment.

1. Frequency: Take photographs daily, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.
2. Vantage Points: Following suggestions by Architect and Contractor, photographer to select vantage points. During each of the following construction phases, take not less than two of the required shots from same vantage point each time to create a time-lapse sequence as follows:

    a. Commencement of the Work, through completion of subgrade construction.
    b. Above-grade structural framing.
    c. Exterior building enclosure.
    d. Interior Work, through date of Substantial Completion.

H. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

1. Do not include date stamp.

END OF SECTION 013233

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 01 Section "Photographic Documentation" for submitting construction photographs and construction videotapes.
5. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
6. Division 01 Section "Closeout Procedures" for submitting warranties.
7. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
8. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
9. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of City's personnel.
10. Divisions 02 through 48 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect’s responsive action.

B. Informational Submittals: Written information that does not require Architect’s responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Architect may provide electronic copies of CAD Drawings of the Contract Drawings for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of

construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 days for review of each resubmittal.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Contractor.
    d. Name and address of subcontractor.
    e. Name and address of supplier.
    f. Name of manufacturer.
    g. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.
    j. Location(s) where product is to be installed, as appropriate.

k. General Contractor's stamp of approval must be on all submittals, indicating that the Contractor has reviewed and approved prior to submitting to the City.

F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number, numbered consecutively.
k. Remarks.
l. Signature of transmitter.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved as submitted" or "Approved as noted".

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating "Approved as submitted" or "Approved as noted" by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. CAD files will only be provided to the contractor upon written request by the contractor and upon receipt by the Architect of the signed release form provided by the Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Manufacturer's catalog cuts.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Mill reports.
    j. Standard product operation and maintenance manuals.
    k. Compliance with specified referenced standards.
    l. Testing by recognized testing agency.
    m. Application of testing agency labels and seals.
    n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit five copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings are otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.

k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 24 by 36 inches (750 by 1000 mm).
3. Number of Copies: Submit five opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit seven copies where copies are required for operation and maintenance manuals. Architect will retain three copies; remainder will be returned. Submit one additional copy for any submittal that must be reviewed by consultant,

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as City's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches

showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit five copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit four copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

a. Mark up and retain one returned copy as a Project Record Document.

K. LEED Submittals: Comply with requirements specified in Division 01 Section "LEED Requirements."

1. Number of Copies: Submit three copies of LEED submittals, unless otherwise indicated.

L. Material Safety Data Sheets (MSDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Architect's review.

1. Architect will not review non-LEED submittals that include MSDSs and will return the entire submittal for resubmittal.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and City's, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number

of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

V. Construction Photographs: Comply with requirements specified in Division 01 Section “Photographic Documentation."

1. Material Safety Data Sheets (MSDSs): Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Approved as submitted
2. Approved as noted
3. Revise and resubmit
4. Rejected.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, City, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Divisions 02 through 48 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where

indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For City's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 49. Contractor shall submit shop drawings for review by all agencies and City.

1.7 QUALITY CONTROL

A. City Responsibilities: Where quality-control services are indicated as City's responsibility, City will engage a qualified testing agency to perform these services.

1. City will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by the City directly to the testing agency.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to City are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by City, unless agreed to in writing.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with City and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify City and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not releases, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to City, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: City will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction, and as follows:

B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. This includes all site work adjacent to property.

2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200
REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl1

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530

AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute	(703) 524-8800

	www.ari.org	
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industry International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood-Preservers' Association www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880

CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee	(703) 295-5000

	www.ejdc.org	
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
FM Approvals	FM Approvals www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
IAS	International Approval Services (Now CSA International)	
ICEA	Insulated Cable Engineers Association, Inc.	(770) 830-0369

	www.icea.net	
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA www.intertek.com	(972) 238-5591
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LEED	Leadership in Energy Conscious and Environmental Design	
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190

MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (303) 697-8441
NFPA	NFPA (National Fire Protection Association)	(800) 344-3555 (617) 770-3000

	www.nfpa.org	
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)	(800) 395-2522 (703) 736-9666

	www.landcarenetwork.org	
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611

SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)	(800) 223-2301 (847) 299-5200

	www.wdma.com	
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl2

IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
FBC	Florida Building Code	(850) 487-1824

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl3

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220

EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl4

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664

DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences www.wbdg.org/ccb	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl5

DCA	Florida Department of Community Affairs Florida Emergency Management www.dca.state.fl.us	(850) 488-8466
FDEP	Florida Department of Environmental Protection www.dep.state.fl.us	(850) 245-2118

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015900 – PROJECT SIGN

PART 1 GENERAL

Contractor, at contractor's expense, shall furnish and install a **4' x 8'** sign (with white painted posts) prior to start of construction. A sample sign template is below but is not specific to the project. The exact style and design of the sign will be provided by the CITY to the Contractor during the preconstruction meeting in PDF format.

See Page 2, "Construction Sign Request Form", for information on the sign for this Project.

END OF SECTION

Construction Sign Request Form

P12200

Title (Bold):

Title (Not Bold):

What's Happening?

Benefits:

Number of Neighbors Benefitted:

Cost:

Month and Year of Expected Completion:

Contractor:

Phone: 954-828-8000

We're Working On:

Project Manager Signature

Date

Senior Project Manager Signature

Date

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. All products indicated as such to posses full documentation for compliance of LEED requirements.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 01 Section "References" for applicable industry standards for products specified.
   2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
   3. Divisions 02 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Contractor to use the specific product specified unless permission has been given to the contractor for substitution of comparable product, by the Architect.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes

of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.

3. Completed List: Within 60 days after date of Notice to Proceed, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. To be considered part of the original bid, all such requests must be submitted to the Architect (10) ten calendar days prior to the bid-opening day. Unless the City has specifically approved a proposed substitution in writing, it will not be considered, under any circumstances, a part of the bid proposal.
2. Documentation: All approvals of substitution shall be accomplished before the completion of the bidding process. Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified material or product cannot be provided.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by City and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and cities.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with Florida Building Code from an organization acceptable to Building Official.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

   a. Form of Acceptance: Change Order or Change Directive.
   b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
   b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to City.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for City.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

3. Refer to Divisions 02 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. City reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles,

dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect. Specific product as called out in the drawings or specifications shall be used and other products as mentioned may be considered for approval by Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers City a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities City must assume. City's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by City, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is

compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and cities, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT

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 administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Related Sections: Division 1 Section 01500 TEMPORARY FACILITIES AND CONTROLS for environmental-protection measures during construction, and location of waste containers at Project site.

1.3 DEFINITIONS

A. Building: Any structure used or intended for supporting or sheltering any use or occupancy as defined in the International Building Code.

B. Construction: Building of any building or structure or any portion thereof.

C. Construction and Demolition Debris or Debris: Used or discarded materials removed from premises during construction or renovation of a structure resulting from construction, renovation, remodeling, repair, or demolition operations on any building, or other structure and shall include, but not be limited to: demolition debris; new construction debris; debris from renovation projects, including tenant improvements and additions; debris from flood control and storm drain construction and; debris from road construction; debris from construction, renovation, or demolition of pump stations and bridges, abutments; earth; and debris from construction, renovation, or demolition of retaining walls and underground utilities. Construction and demolition debris does not include hazardous waste, contaminated earth or soil, and materials without any use or market value even after re-manufacturing.

D. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

E. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

F. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

G. Divert: To use material for any purpose other than disposal in a landfill.

H. Diversion Requirement: Percentage of the total construction and demolition debris generated by a project that is required to be diverted from a landfill as required for this project.

I. Estimated Cost of Construction: Total projected cost of completing a proposed project.

J. Green Building Practices: A whole systems approach to the design, construction, and operation of buildings and structures that helps mitigate the environmental, economic, and social impacts of construction, demolition, and renovation. Green building practices such as those described in the LEED rating system, recognize the relationship between natural and built environments and seek to minimize the use of energy, water, and other natural resources and provide a healthy, productive environment.

K. LEED: Leadership in Energy and Environmental Design Rating System as established by U.S. Green Building Council.

L. LEED TM Green Building Design and Construction, New Construction Rating SystemTM: Version 3 of the Leadership in Energy and Environmental Design (LEEDTM) Rating SystemTM.

M. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

N. Recycling: Process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.

O. Reuse: Further or repeated use of construction or demolition debris. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

P. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

Q. Structure: That which is built or constructed, an edifice or building of any kind or any piece of work artificially built or composed of parts joined together in some definite manner and permanently attached to the ground.

1.4 PERFORMANCE REQUIREMENTS

A. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible.

B. Develop waste management plan that results in end-of-Project rates for salvage/recycling of at least 75 percent by weight of total waste generated by the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials**.**

1.5 SUBMITTALS

A. The following shall be submitted in accordance with SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

1. Preconstruction Submittals: Waste Management Plan: Submit plan within 5 days of date established for the Notice to Proceed.

2. Certificates: Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:
   a. Material category.
   b. Generation point of waste.
   c. Total quantity of waste in tons.
   d. Quantity of waste salvaged, both estimated and actual in tons.
   e. Quantity of waste recycled, both estimated and actual in tons.
   f. Total quantity of waste recovered (salvaged plus recycled) in tons.
   g. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
3. Closeout Submittals:
   a. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
   b. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
   c. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
   d. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
   e. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
4. LEED Submittal: LEED letter template completed on LEED On Line for Credit MR 2.1/2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

1.6 QUALITY ASSURANCE

A. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of land-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Recycled Materials: Include list of local receivers and processors, and type of recycled materials each will accept.
   a. Include names, addresses, and telephone numbers.
4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. Implement waste management plan as approved by the Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Contractor shall submit Waste Reduction Progress Reports concurrent with each Application for Payment, in accordance with paragraph "Submittals." Prepare LEED letter template for Credit MR 2.1/2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. At completion of project Contractor shall also submit Waste Reduction Calculations, Records of Donations, Recycling and Processing Facility Records, and Landfill and Incinerator Disposal Records in accordance with paragraph entitled "Submittals."

C. Waste Management Coordinator: Designate a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, and donated.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Donation: Permitted on Project site.

3.3 RECYCLING CONSTRUCTION WASTE, GENERAL

A. Hire a waste company that will do certified off site restoration and documentation and/or a combination of the following

B. Recycle paper and beverage containers used by on-site workers.

C. Recycling Receivers and Processors: Contractor to procure local recycling receivers and processors for the duration of construction activities at the building site.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off the Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

B. Piping: Reduce piping to straight lengths and store by type and size.

C. Separate supports, hangers, valves, sprinklers, and other components by type and size.

D. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-offs of Lumber: Grind or chip into small pieces.

2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Review with Landscape Architect use clean ground gypsum board as inorganic soil amendment.

3.6 DISPOSAL OF WASTE

A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to the Owner.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off the Owner's property and legally dispose of them.

3.7 WASTE MANAGEMENT PLAN

A. A Waste Management Plan shall be submitted by the contractor. Example of Comingled Waste Management Plan as follows:

Construction Waste Management Plan – Commingled

Project: **P11242** - **FXE U.S. Customs & Border Protection Facility**
Contractor: **(Contractor's Name)**

Objective: To maximize waste diverted from landfill by recycling as much construction debris as possible.
Method: Project owner and builder **(Contractors name)** Construction will use a waste hauler/contractor who specializes in material recycling. **(Hauler's name)** owns and operates the local Recycling facilities.

(Hauler's name) roll-off containers will be used onsite to collect comingled waste. (Hauler's name) will haul project waste from the jobsite to their **(location address)**, Material Recovery Facility for sorting.

(Hauler's name) separates construction and demolition debris into the following categories: concrete, wood, metals, cardboard, dirt, drywall, and miscellaneous mixed waste. Materials are then sold to local recycling centers for reuse in the manufacture of specific products (i.e. the cardboard and metals) or processed (via screening or grinding) and resold as base (i.e. the concrete).

Separation: Waste will be comingled with the exception of cardboard; to protect the cardboard from damage we will provide a separate, labeled container.

Documentation: **(Hauler's name)** will provide monthly waste reports detailing material types and totals.

Final Destinations for Waste:
• Concrete: **(Example: Road Base/Drainage.)**
• Wood: **(Example: Mulch.)**
• Metals: **(Example: FPT/Sunrise Metals.)**
• Cardboard: **(Example: All-American Recycling.)**
• Dirt: **(Example: Central Landfill, Pompano Beach, Florida.)**
• Drywall: **(Example: Central Landfill, Pompano Beach, Florida.)**
• Miscellaneous Waste: **(Example: Central Landfill, Pompano Beach, Florida.)**

3.8 SCHEDULE

Construction Waste Description	Diverted or Landfill Waste?	If Comingled waste is diverted off-site, enter percentage diverted (%)	Hauler or Location	Waste

END OF SECTION 017419

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Photographic Documentation" for submitting Final Completion construction photographs and negatives.
3. Division 01 Section "Execution Requirements" for progress cleaning of Project site.
4. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
5. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
6. Divisions 02 through 48 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Submit list of all subcontractors including names, addresses (with zip code) and telephone numbers and dollar amount of work performed.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting City unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by City. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to City. Advise City's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Complete final cleaning requirements, including touchup painting.
12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit final releases of lien from all subcontractors and suppliers
3. Submit pest-control final inspection report and warranty.
4. Instruct City's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
5. No later than 30 days after completion of the job, the contractor shall provide IA/SMD with all blueprints of the space and all associated areas (i.e. roof, garage) on AutoCAD and a hard copy of the floor plan.
6. The security system shall be included in the blueprints after the initial floor design. The security system shall be on a separate layer. It shall not be included on the same layer of the electrical system. The security system shall be treated as sensitive information and shall not be given to any contractor who does not have a need to know. A hardcopy of as-built of the Security System along with the AutoCAD copy shall be provided to SMD no later than 30 days after the completion of the job. (This shall include any changes made during the construction phase). Security plan shall include furniture layout.
7. The CBP/Security Management Division requires one business week after the space has been totally built out (including carpet, painting, electrical, plumbing, HVAC, communication cable, and video cable, except for the installation of the ceiling tile) to complete our security and communication inspections once these inspections are completed. After that, a final walk through shall take place by the SMD and GSA to prepare a punch list to present to the contractor/lessor. No security project shall be considered substantially complete without a final walk through.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled

requirements. Final payment will only be made after ALL unconditional release of liens from all subcontractors and suppliers are received by the City.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project number.
    b. Project name
    c. Date.
    d. Name of Contractor.
    e. Page number.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within [15] days of completion of designated portions of the Work that are completed and occupied or used by City during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

E. Submit Certificate of Occupancy to the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    j. Remove labels that are not permanent.
    k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on City's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Date of submittal.
4. Name, address, and telephone number of Contractor.
5. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number

in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of City's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include

source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by City's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by City's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 48 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. No later than 30 days after completion of the job, the Contractor shall provide City/IA/SMD with record prints of the Contract Drawings as well as Auto CAD files. A hard-copy of the security system as-built, as well as the Auto CAD files, shall also be provided to the City/IA/SMD no later than 30-days after completion of the job.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
        1) Document with photographs.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Work Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
7. Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. Make corrections where required.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

    a. Project number.
    b. Project name.
    c. Date.
    d. Designation "PROJECT RECORD DRAWINGS."
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

C. Record Documents of water, sewer and drainage must be provided for the General Contractor by a Professional Land Surveyor and must be satisfactory for approval by the Broward County Health Department and the Broward County Department of Planning and Environmental Protection.

D. Final pay request will not be processed until Record Documents have been completed and submitted to the City.

END OF SECTION 017839

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing City's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

C. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Division 01 Section "Allowances."

D. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Division 01 Section "Unit Prices."

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator, instructor, and videographer.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within 5 days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

   a. Name of Project.
   b. Name and address of videographer.
   c. Name of Architect.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for City's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with City's operations. Adjust schedule as required to minimize disrupting City's operations and to ensure availability of City's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and City for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct City's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. City will furnish an instructor to describe City's operational philosophy.
3. City will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with City, through Architect and, through Construction Manager, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral and a written performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to City. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to City, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to **City**, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 031000
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 033000 – Cast-In-Place Concrete.

1.2 REFERENCE STANDARDS

A. American Concrete Institute (ACI) Latest Edition:
   1. 301 Specifications for Structural Concrete for Buildings.
   2. 347 Recommended Practice for Concrete Formwork.

B. American Society for Testing and Materials (ASTM):
   1. D1751 Pre-formed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

1.3 SUBMITTALS

A. General: In compliance with Section 013300 and as specified herein.

B. Shop Drawings: Illustrating:
   1. Pertinent dimensioning.
   2. Methods of construction.
   3. Arrangement of joints.
   4. Location of bracing and temporary supports.
   5. Ties and shores.
   6. Schedule of erection and stripping.

C. Product Data: Illustrating and describing:
   1. Inserts, anchors, sleeves and other embedded items.
   2. Form ties.
   3. Form oil and form release agent.
   4. Round column forms.
   5. Expansion joint filler.

D. Warranty: Submit written warranty issued by form release agent manufacturer that form release agent will not cause staining, discoloration, or texturing of concrete, prevent proper bonding of subsequently applied materials, or leave a waxy or oily residue.

1.4 DELIVERY AND STORAGE

A. Storage:
   1. Store new and reusable form lumber and form plywood under heavy waterproof coverings, or where well protected from inclement weather.

2. Stack oiled form plywood on sticking to permit proper ventilation between uses.
3. Store metal forms in such manner to prevent damage by denting, warping twisting and rusting.

PART 2 - PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Lumber: No. 2 Southern Pine or No. 2 Douglas Fir-Larch, S4S; true and straight members free from cupping, warping, loose knots, excessive checking and other structural defects.

B. Form Plywood: Not less than 5/8-inch thick, exterior type, Class I, Grade "B-B", mill oiled and edge sealed.
1. Concealed surfaces in Finished Work: Standard "B-B Plyform".

C. Form Liners: Units of face design, texture, arrangement and configuration as specified in the architectural drawings and Section 033300. Furnish with manufacturer recommended liquid release agent that will not bond with, stain or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete.

2.2 PREFABRICATED FORMS

A. Round Column Forms: Heavy-duty, two-piece sectional column forms suitable for multiple uses.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

2.3 ACCESSORIES

A. Anchor Slots: Minimum 22 gauge galvanized steel dovetail anchor slot with removable filler insert.

B. Construction Joint Forms: Galvanized steel, tongue and groove shape.

C. Expansion Joint Filler: ASTM D1751, pre-molded, asphalt impregnated cellulose fiber, thickness and depth indicated. For sealed joints use bond breaker such as polyethylene tape to prevent bleeding.
1. The Burke Company "Fiber Expansion Joint".
2. W. R. Meadows, Inc. "SealTight Fibre Expansion Joint".
3. Sonneborn "Sonoflex Cane".

D. Flashing Reglets: 26 gauge galvanized steel, 1-1/2 inch deep x 1/2-inch opening; install where required to receive waterproofing membrane or flashing.

E. Form Coating:
1. Concealed from View: Form oil or release agent.

2. Exposed to View: Non-staining, non-residue release agent with required warranty.
   a. The Burke Company "Burke Release".
   b. L & M Construction Chemicals "Debond".
   c. Napco Construction Chemicals "Petkote".
   d. Sonneborn "Cast-Off".

F. Form Ties: Removable-type adjustable rod ties with minimum strength of 3000 pounds each that do not leave hole greater than 7/8-inch diameter, or snap-ties that break off not less than one-inch back of concrete surface.
   1. Provide ties with swaged washer or other acceptable device to prevent mortar leakage along tie.

G. Moldings and Chamfer Strips: "C-Select" or "Finish" Southern Pine, straight, sound, and free of knots and other defects.

H. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of sufficient strength and character to maintain formwork in place while placing concrete.

I. Shores: Tubular steel or wood forms capable of safely supporting vertical and lateral loads imposed by formwork, concrete and other construction loads and capable of preventing excessive deflection during concrete placing operations.

PART 3 - EXECUTION

3.1 DESIGN

A. General:
   1. Contractor is solely responsible for safety of formwork.
   2. Design formwork in compliance with ACI 301 and ACI 347, and to resist imposed loads and pressures.
   3. Properly brace and tie forms together to maintain their position and shape during concrete placement.
   4. Minimize form joints.
   5. Camber formwork as required to take up settlement caused by concrete placing.
   6. Shoring and formwork shall be designed by an engineer registered in the State of Florida.
   7. Shop drawing shall be submitted which bears the embossed seal of the engineer.

B. Strength: Withstand weight of concrete and loads due to placing operations without deformation beyond 1/360 of spans.

C. Stripping: Arrange and assemble formwork to permit dismantling and stripping without damage to concrete. Design formwork to permit stripping without removal of principal shores where required.

3.2 FORMWORK ERECTION

A. Construction:
   1. Construct forms to provide finished profiles, shapes and dimensions indicated in Drawings.
   2. Construct forms with tight fitting joints to prevent mortar leakage and to withstand high frequency mechanical vibration.

B. Erection:
   1. Erect forms plumb, straight, true-to-lines and levels, and securely brace into position.
   2. Arrange forms to allow stripping without removal of principal shores, where and when these are required to remain in place.
   3. Provide bracing to ensure stability of formwork.
   4. Provide temporary ports in formwork where required to facilitate cleaning and inspection.
      a. Locate openings at bottom of formwork to allow flushing water to drain.
      b. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

C. Tolerances: Construct formwork in compliance with ACI 301 and ACI 347 to maintain following maximum tolerances:
   1. Deviation From Horizontal and Vertical Lines: 1/4-inch in 10 feet.
   2. Deviation of Building Dimensions Indicated in Drawings and position of Partitions, Walls, and Columns: 1/4-inch in 10 feet.
   3. Deviation in Cross-Sectional Dimensions of Columns or Beams or Thickness of Slabs and Walls: Plus or minus 1/4-inch.

3.3 FORM RELEASE AGENT

A. Apply form release agent to form surfaces prior to placing reinforcing steel, anchoring devices, and embedded items.
   1. Release agent required on form surfaces where concrete is exposed in finished work.

B. Do not apply form release agent where concrete surfaces will receive special finishes and applied coverings that are affected by agent.
   1. Soak inside surfaces of untreated forms with clean water.
   2. Keep surfaces wet prior to placing concrete.

3.4 INSERTS, EMBEDDED ITEMS, OPENINGS AND ACCESSORIES

A. Provide formed openings for pipes, conduits, sleeves, and other work embedded in and passing through concrete.
   1. Coordinate work of other Sections and cooperate with trades involved in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.
   2. Install anchor bolts in compliance with approved setting plans.

3. Do not perform work unless indicated in drawings or reviewed prior to installation.
4. Do not place concrete until work is accurately located and securely fastened into position.

B. Anchor Slots: Install in concrete surfaces abutted by ends of masonry walls and in concrete surfaces faced with masonry. Set slots vertically, extending continuously to full height of adjacent masonry at centerlines of masonry wall ends and at 2'-0" on center in walls faced with masonry.

C. Chamfer Locations: Exterior corners of beams, joints, columns, and where indicated in Drawings.

D. Joints: Secure expansion joint filler in place as shown in Drawings to prevent displacement when placing concrete. Bore holes through filler for rebar where required and hold down with removable spacer where sealant is to be applied. Apply polyethylene, foil, or other bond breaker tape where sealant is to be applied.

E. Waterstops:
1. Strips:
   a. Prime joint, remove one strip of paper and place waterstop in keyed joints. Lap ends one-inch.
   b. Remove second paper strip immediately prior to placing concrete.
2. Ribbed with Center Bulbs:
   a. Secure to forms.
   b. After form removal, extend into next concrete placement.
   c. Splice as recommended by manufacturer.
   d. Prevent puncture tears and damage.

3.5 FIELD QUALITY CONTROL

A. Inspect and check completed formwork, shoring, and bracing to ensure that work is in compliance with formwork design, and that supports, fastenings, wedges, ties, and parts are secure.

B. Bracing and Shoring:
1. Provide necessary whales, studs, and bracing to prevent forms from bulging and sagging.
2. Double-wedge shores at bottom and keep wedges tight. Do not place shores on top of previously placed concrete for at least 48 hours after placing.
3. Comply with ACI 301 for reshoring.

C. Formwork for Exposed Concrete:
1. Use high density overlay plywood sheets in sizes necessary to provide uniform appearance on exposed surfaces. Fill butt joints between plywood sheets to prevent leakage. Place form ties in uniform and symmetrical pattern.
2. Place moldings or chamfer strips in corners of square column, beam and wall forms except where square corners are indicated.

D. Used form materials may be cleaned and reused if required finished surfaces can be produced.
   1. Use form with sheet metal patches over cracks and holes for concealed work only.

E. Records: Maintain record of concrete placement, shoring and form removal.
   1. Record rest cylinder strength used to determine early form removal.
   2. Keep record available for Architect's examination.

3.6 FORM REMOVAL

A. Do not remove forms until concrete develops sufficient strength to sustain its own weight plus any superimposed loads, and in no case sooner than permitted by ACI 347.

B. Remove forms in such sequence as to constantly insure structural adequacy.

C. Remove form ties and projecting nails from concrete surfaces when forms are stripped.

D. When forms are to be reused, withdraw nails, clean, patch holes and apply uniform coat of form release agent, or form oil, immediately after stripping, and store until reused.

E. Test cylinders may be made at Contractor's expense and unless directed otherwise by Architect, forms may be stripped from locations when concrete has attained 75% of required 28-day compressive strength.

END OF SECTION 031000

SECTION 032000
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

A. American Concrete Institute (ACI)Latest Edition:
1. 301 Specifications for Structural Concrete for Buildings.
2. 318-05 Building Code Requirements for Reinforced Concrete.
3. SP66 ACI Detailing Manual.

B. American Society for Testing and Materials (ASTM):
1. A82 Steel Wire, Plain, for Concrete Reinforcement.
2. A185 Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
3. A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. American Welding Society (AWS):
1. D1.4 Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute (CRSI):
1. MSP1 Manual of Standard Practice.
2. 63 Recommended Practice for Placing Reinforcing Bars.
3. 65 Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.2 SUBMITTALS

A. General: In compliance with Section 013300 and as specified herein.

B. Shop Drawings: Detail reinforcing in compliance with ACI 315.
1. Provide fully detailed bar lists, bending diagrams, and placing plans.
2. Indicate splices and splicing methods.
3. Indicate types and grades of steel.
4. Indicate quantities of reinforcing steel and wire fabric.
5. Indicate supporting and spacing devices.

C. Product Data: Manufacturer's specifications and brochures for bar support devices, and:
i. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
ii. Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

D. Reports: Certified copy of all mill reports on reinforcing steel, indicating physical properties and chemical analysis.

1.3 DELIVERY AND STORAGE

A. Deliver reinforcing steel to site in easily handled bundles with identification tags securely wired into place.
   1. Store reinforcing to prevent damage and protect from corrosion and deformation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel: ASTM A615; Grade 60.

B. Welded Steel Wire Fabric: ASTM A185; flat sheets.

C. Bar Chairs:
   1. Concealed: 16 gauge galvanized steel wire with 3 x 3-inch base, or solid plastic of proper sizes and design to properly support and position reinforcing steel.
   2. Exposed: Fabricated from stainless steel, solid plastic, or galvanized wire with plastic tipped feet.

D. Tie Wires: 16 gauge annealed steel.

E. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%..

2.2 FABRICATION

A. Fabricate reinforcing steel to required shapes and dimensions in compliance with CRSI "Manual of Standard Practice" and ACI 315 with tolerances specified in ACI 301.

B. Do not heat bars for bending or straightening. Do not tack weld bars.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove grease, dirt, loose mill scale, rust and foreign substances from reinforcing before placing.

B. Clean splashed concrete from reinforcing steel projecting from previously placed concrete before making splices and before placing subsequent concrete.

3.2 INSTALLATION

A. Place reinforcing steel in compliance with CRSI "Recommended Practice for Placing Reinforcing Bars" and ACI 301. Provide not less than minimum coverage indicated in structural drawings over reinforcing steel.

B. Placing:
   1. Comply with CRSI publication Placing Reinforcing Bars. Provide not less than ACI minimum coverage over reinforcing when coverage is not indicated in Drawings.
   2. Place no reinforcing until forms have been coated with release agent.
   3. Place reinforcing supported and secured against displacement. Do not deviate from indicated alignment.
   4. Saddle tie reinforcing at intersections and laps. Wire stirrups to both top and bottom bars.
   5. Lap welded wire fabric one mesh panel at ends and sides, unless indicated otherwise.
   6. Protect reinforcement from damage and displacement after installation and during concrete placing operations. Do not support runways and chutes upon reinforcing. Do not permit conveying equipment to be wheeled directly upon reinforcing.

C. Bar Chairs: Support reinforcing upon proper support devices in compliance with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature".
   1. Space supports not more than 3 bar spaces each way for slabs on grade.
      a. Precast concrete blocks of same mix design as concrete, with tie wires embedded into blocks may be used for slabs on grade, turned down beams and footings in lieu of bar chairs to support reinforcing.
   2. Locate bar and welded wire fabric reinforcing in slabs on grade and slabs on fill to occur within upper one-third of slab thickness.
   3. When in contract with forms and underside of floor slabs with applied finishes, or to be exposed, provide chairs specified for exposed-to-view.

3.3 FIELD QUALITY CONTROL

A. Cutting and Welding: No reinforcing bars cut or welded in field without prior consent of Structural Engineer.

B. Splicing:
   1. Splicing shall conform to ACI 318.
      a. Make splices as indicated in Drawings.
      b. Obtain Architect's approval of splices not indicated in Drawings before making splices.
   2. Do not splice bars at points of maximum stress.
   3. Stagger splices at adjacent bars.

C. Protection: Protect reinforcement from damage and displacement after placing and during concrete placement operations. Do not support runways and chutes upon

reinforcing. Do not permit conveying equipment to be wheeled directly upon reinforcing.

END OF SECTION 032000

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Shoring and Bracing: Indicate proposed schedule and sequence of work, including temporary shoring and bracing.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.

3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Floor and slab treatments.
7. Adhesives.
8. Vapor retarders.
9. Repair materials.

G. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Finisher.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or II, gray or white. Cements may be supplemented with the following:

a. Fly Ash: ASTM C 618, Class C F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoco; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.

m. Tamms Industries, Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. US Mix Products Company; US Spec Maxcure Resin Clear.
p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of finishes.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. Burke by Edoco; Spartan Cote WB II.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
f. Euclid Chemical Company (The); Aqua Cure VOX.
g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
n. Tamms Industries, Inc.; Clearseal WB 150.
o. Unitex; Hydro Seal.
p. US Mix Products Company; US Spec Hydrasheen 15 percent
q. Vexcon Chemicals, Inc.; Starseal 309.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of finishes.

1. Available Products:

a. Burke by Edoco; Spartan Cote WB II 20 Percent.
b. ChemMasters; Safe-Cure Clear.
c. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; High Seal.
d. Dayton Superior Corporation; Safe Cure and Seal (J-19).
e. Euclid Chemical Company (The); Diamond Clear VOX.
f. Kaufman Products, Inc.; SureCure Emulsion.
g. Lambert Corporation; Glazecote Sealer-20.
h. L&M Construction Chemicals, Inc.; Dress & Seal WB.
i. MBT Protection and Repair, Div. of ChemRex; MasterKure-N-Seal VOC.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure 0800.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 200E.

m. Sonneborn, Div. of ChemRex; Kure-N-Seal.
n. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
o. Tamms Industries, Inc.; Clearseal WB STD.
p. Unitex; Hydro Seal 18.
q. US Mix Products Company; US Spec Radiance UV-25
r. Vexcon Chemicals, Inc.; Starseal 0800.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: Unless otherwise noted, ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: <4.0> percent, plus or minus 1.5 percent at point of delivery for exterior exposed concrete.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.

B. Extend shoring to ground floor to distribute loads in such a manner that no floor or roof members will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, and only at locations previously approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Locate joints in walls beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and subject to approval by the Engineer.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed surfaces with a straightedge and strike off to correct elevations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: All testing and inspections by general contractor. Contractor will engage a qualified testing and inspecting agency to perform tests and to submit reports to city’s project manager.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.
8. As required by Building Department.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's placement of each concrete mixture plus one set for each additional 20 cu. yd. or fraction thereof.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's placement of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's placement of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Engineer, Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL

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 structural steel and architecturally exposed structural steel.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.
2. Division 3 Sections “Cast-in-Place Concrete” for embedded assemblies for structural steel connections.
3. Division 5 Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
4. Division 9 Section "Special Coatings" for surface preparation and priming requirements.
5. Division 9 Section "Painting" for surface preparation and priming requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 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, and:

i. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

ii. Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Include Shop Drawings signed and sealed by a qualified professional engineer responsible for their preparation.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Shear stud connectors.
5. Shop primers.
6. Non-shrink grout.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:

a. Category: Category I, conventional steel structures.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
3. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
4. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
5. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
6. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
7. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Professional Engineer Qualifications: A professional engineer who is legally authorized and licensed to practice engineering in the state of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As follows:

1. Carbon Steel: ASTM A 36.
2. High-Strength, Low-Alloy Columbium-Vanadium Steel: ASTM A 572 Grade 50.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

D. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 36 or ASTM A 307.
2. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
3. Washers: ASTM A 36.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts with direct tension indicators (ASTM F959), heavy hex carbon-steel nuts, and hardened carbon-steel washers.

F. Welding Electrodes: AWS E70XX – Low Hydrogen electrodes.

G. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%.

2.2 PRIMER

A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, non-corrosive, non-staining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6, and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

F. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Shop install and tighten high-strength bolts according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds in architecturally exposed steel that are 1/4 inch and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
1. SSPC-SP 3 "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 1.5 mils.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

    a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Finish sections thermally cut during erection equal to a sheared appearance.

I. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/4 inch and larger. Grind flush butt welds.

3.5 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Field-bolted connections will be tested and inspected according to RCSC's "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

3.6 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Division 9 Section "Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 051200

SECTION 053100
STEEL DECKING

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. Roof deck.

B. Related Sections include the following:

1. Division 3 Section "Insulating Concrete" for fill.
2. Division 5 Section " Structural Steel"
3. Division 5 Section "Cold Formed Metal Framing".
4. Division 5 Section "Miscellaneous Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, and deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

F. LEED credit information

i. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

ii. Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

C. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

D. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-120 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:
   a. Martin Fireproofing Corporation, Inc.
   b. BHP Steel Building Products USA Inc.
   c. Consolidated Systems, Inc.
   d. Epic Metals Corp.
   e. Marlyn Steel Products, Inc.
   f. Nucor Corp.; Vulcraft Div.
   g. Roof Deck, Inc.
   h. United Steel Deck, Inc.

i. Verco Manufacturing Co.
j. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.
k. Valley Joist, Inc.; Division of EBSCO Industries, Inc.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Galvanized Steel Sheet: ASTM A 446, Structural Steel (SS), Grade A with minimum yield strength of 33 ksi, G90 zinc coating.
2. Deck Profile: Type B, wide rib or as specified on structural drawings.
3. Profile Depth: 1-1/2 inches or as specified on structural drawings.
4. Design Uncoated-Steel Thickness: 0.0295 inch (for 22 gage) and 0.0355 inch (for 20 gage)
5. Span Condition: Double span or more.
6. Coverage: 36”
7. Side Laps: Overlapped.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum size.

C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

D. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, [0.0598 inch (16 gauge)] thick, with factory-punched hole of 3/8-inch minimum diameter.

G. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (14 gauge) thick, of same material and finish as deck, with 3-inch wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

H. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (14 gauge) thick, of same material and finish as deck. For drains, cut holes in the field.

I. Galvanizing Repair Paint: ASTM A 780, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated.

1. Weld Diameter: 5/8 inch nominal.
2. Weld Spacing: Space welds as indicated on the drawings.

B. Side-Lap and Perimeter Edge Fastening: provide number of side-lap fasteners per span as indicated on the drawings:

1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
2. Fasten with a minimum of 1-1/2 inch long welds.

C. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 6 inches apart with at least 1 weld at each corner.

D. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000
COLD FORMED METAL FRAMING

PART 1 – GENERAL`

1.1 SUMMARY

A. System Description:

1. Non-load bearing steel stud walls and soffit systems.

2. Steel joists and rafters.

3. Metal trusses

B. Related Sections:

1. Section 055000 – Metal Fabrications.

2. Section 081113 – Steel Doors and Frames.

3. Section 092000 – Metal Studs, Lath, Suspension Ceiling, Plaster, and Stucco.

4. Section 092500 – Gypsum Board.

1.2 SUBMITTALS

A. Submit properly identified manufacturer's literature and technical data including specifications and installation instructions before starting work.

B. Samples:

1. Metal framing.
2. Required accessories.

C. Shop Drawings: Show layouts and sections coordinated with contract documents showing framing, anchorage accessories, and connection details.

1. For systems not completely detailed in Contract Documents, provide the following in addition to shop drawings:

(a) Structural design calculations for framing members, connections and accessories. (to be provided upon request)
(b) Calculate structural properties of framing and accessories in accordance with AISI “Specification” for the Design of Cold Formed Steel Structural Members.

2. Calculations and Engineering Shop Drawings shall be signed and sealed by a Florida Registered Engineer.

D. LEED credit information:

i. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
ii. Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Light Gage Metal Framing:

1. Dale/Infor Industries, Inc.
2. Dietrich Industries, Inc.
3. Dole Industries, Inc.
4. Marino Industries, Inc.
5. Unimast Incorporated (USG).

2.2 MATERIALS

A. Steel Studs thickness and grade as required by Contract Drawings or Shop Drawings, but not less than the following:

1. 3-5/8 inch, 22 gage, (minimum), galvanized.
2. 4 inch, 20 gage (minimum), galvanized.
3. 6 inch, 20 gage (minimum), galvanized.
4. 8 inch, 18 gage (minimum), galvanized.

B. Steel Runner Track thickness and grade as required by Contract Drawings or Shop Drawings, but not less than the following:

1. 22 gage for 3-5/8 inch studs.
2. 20 gage for 4 inch and 6 studs.
3. 18 gage for 8-inch studs.

C. Coating: Steel studs and runner track shall comply with ASTM 525 and have a G-60 galvanized coating.

D. Steel Studs, Runner Track, and Accessories:

1. 12, 14, and 16 Gage: Form of steel meeting the requirements of ASTM A653, Grade D, with minimum yield of 50,000 psi.
2. 18, 20 and 22 Gage: Form of steel meeting with the requirements of ASTM A653, Grade A, with a minimum yield of 33,000 psi.

E. Metal Screws: Corrosion resistant coasted, self-drilling, pan or hex washer head. Provide screw type and size as required by Contract Drawings or Shop Drawings (as applicable).

F. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%.

PART 3 - EXECUTION

3.1 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.2 INSTALLATION

A. Use of powder-activated shots is prohibited, except in anchoring tracks to concrete or steel.

B. Stud Spacing: Maximum 16 inches on center, unless otherwise indicated on the drawings.

1. Frame corners with three studs.
2. Frame wall openings wider than stud spacing with double studs at each jamb.

C. Runner Track: Securely anchor to floor and overhead structure as detailed on Contract Drawings or Shop Drawings (as applicable).

D. Seat studs squarely in runner track with stud web and flanges abutting track web, plumbed and aligned, and securely attached to flanges each side or web of both upper and lower runner tracks, with No. 8 screws, unless otherwise noted.

E. Install framing accessories and bridging as shown on Contract Drawings or Shop Drawings as applicable.

END OF SECTION 054000

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Elevator machine beams.
3. Support angles for elevator door sills.
4. Steel weld plates and angles for casting into concrete not specified in other Sections.
5. Miscellaneous steel trim including steel angle corner guards.
6. Metal ladders.
7. Metal bollards.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 05 Section "Metal Stairs."
4. Division 06 Section "Rough Carpentry" for metal framing anchors.
5. Division 14 Section "Hydraulic Elevators" for elevator pit ladders and support angles for elevator door sills.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Welding certificates.

C. LEED Credit information:

i. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

ii. Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications 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 metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

C. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Galvanized steel complying with ASTM A 653/A 653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness.

D. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

E. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

C. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, 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, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 painting Sections.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3,000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.9 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.11 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Space siderails 18 inches apart, unless otherwise indicated.
4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.

B. Steel Ladders:

1. Siderails: Continuous, 3/8-by-2-1/2 inch steel flat bars, with eased edges.
2. Rungs: 3/4-inch diameter steel bars.
3. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
4. 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.

C. Aluminum Ladders:

1. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
2. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
3. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.

B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.

2.15 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

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.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING METAL BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 07210

BUILDING INSULATION

PART 1GENERAL

A. Provide insulation in all roof areas above air-conditioned space, on the interior side of exterior walls and the inside cavities of interior partitions.

1.01 SECTION INCLUDES

A. Roof Thermal Insulation:
   1. Existing

B. Wall Thermal Insulation:
   1. Exterior Walls – “FI-FOIL” (R-7.1).
   2. Interior Partitions – CertainTeed 2.5”-6” Sound Attenuation Blankets (unfaced)

1.02 RELATED SECTIONS

A. 013300 - Submittal Procedures
B. 06100 - Rough Carpentry (Wood wall furring and studs).

1.03 SUBMITTALS

A. Submit the following:

   1. Product data, properly identified for each type of insulation specified including generic types, brands, catalog numbers, type numbers, densities with "r" values for 1 inch thickness (aged values for plastic foam), insulation thickness’ with"R" values for specified or indicated thicknesses, surface burning characteristics per ASTM tests, adhesives, accessories and manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

   1. Surface Burning Characteristic: ASTM E84.

   2. Fire Resistance Ratings: ASTM E119.

3. Combustion Characteristics: ASTM E136.

B. Single Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.05 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 recommendations for handling, storage, and protection during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of substances harmful to insulation’s or vapor retarders, including removal of projections that might puncture vapor retarders.

3.03 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

B. Extend insulation full thickness to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

C. Apply insulation of required thickness, unless otherwise shown or required making up total thickness.

3.06. PROTECTION

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

END OF SECTION

SECTION 07270

FIRE STOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. For areas where ceilings and partitions are provided: Fire stopping and fire calking between tops of non-bearing partitions, tops of non-bearing walls and overhead structural slabs.

B. For areas where ceilings and partitions are provided: Fire stopping and fire and calking at perimeters of ducts, piping, conduits and cables penetrating fire rated walls and partitions.

1.02 RELATED SECTIONS

A. 013300- Submittal Procedures
B. 03300 - Cast In Place Concrete.
C. 09200 - Gypsum Drywall Systems
D. Division 15 - Mechanical (For pipe and duct penetrations).
E. Division 16 - Electrical (For conduit penetrations).

1.03 SYSTEM PERFORMANCE

A. Provide joint fire stopping packing and joint fire and smoke stopping sealers (calking) that have been produced and installed to establish and maintain fire rated fire-tight and smoke-tight continuous seals where partitions abut overhead structure and where pipes, conduits and ducts penetrate roofs and partitions.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Acceptable to fire stopping and fire and smoke barrier sealer (caulking) manufacturer. Engage an installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.

B. Single Source Responsibility for Fire and Smoke Stopping Joint Backing and Sealer Materials: Obtain fire stopping and joint sealer materials from a single manufacturer for each different product required.

C. Fire-safing insulation, fire and smoke barrier caulk or putty, fire barrier wrap/strips, fire

barrier partitions, fire barrier covers complete with necessary metal clips, supports, fastenings and covers shall meet ASTM E814, Fire Test of Through Penetration Fire Stops for a (2) (3) hour fire rating for floors and roofs and (1) and (2) hour fire rating for partitions and (1), (2) and (3) hour fire rating for fire walls as indicated.

D. Materials used shall be listed in U.L. Building Materials Directory; Through Penetration Fire Stops Systems and Fill Void or Cavity Materials.

1.05 SUBMITTALS

A. Submit properly identified product data including material specifications, published installation details and directions; and U.L. classified fire test data for each roof penetration and fire wall and partition penetration condition.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about 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 manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

C. Protect finished fire and smoke stopping packing and sealers from damage. Replace damaged fire and smoke stopping packing and sealers.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of fire and smoke stopping joint sealers under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
   2. When joint substrates are wet due to rain, frost, condensation, or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide fire and smoke stopping joint sealers, joint fire stopping packing and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealer manufacturer based on testing and field experience.

2.02 FIRE-RESISTANT JOINT SEALERS

A. General: Provide manufacturer's standard fire and smoke stopping sealant, with accessory materials, having fire resistance ratings indicated as established by testing identical assemblies per ASTM E814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Foamed In Place Fire and Smoke Stopping Sealant: Two part, foamed in place, silicone sealant formulated for use in a through penetration on fire stop system for filling openings around cables, conduit, pipes and similar penetrations through walls.

C. One Part Fire and Smoke Stopping Sealant: One part elastomeric sealant formulated for use in a through penetration fire stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls.

D. Products: The Fire and Smoke Stopping Sealer (Calking) specified in this section is based on 3M Brand System. The following alternate manufacturers and brands will be acceptable, subject to compliance with requirements, provide one of the following:
   1. Foamed In Place Fire and Smoke Stopping Sealant:
      a. Dow Corning Corp.: Dow Corning Fire Stop Foam.
      b. General Electric Co.: Pensil 200 Foam.
   2. One Part Fire and Smoke Stopping Sealant:
      a. Dow Corning Corp.: Dow Corning Fire Stop Sealant 2000.
      b. General Electric Co.: Pensil 100 Sealant.
      c. The Carborundum Company Fibers Division: Fyre Putty.

2.03 FIRE SAFING INSULATION JOINT SEALER BACKING

A. General: Provide sealer backings of material and type which are compatible with joint substrates and sealers; and are approved for applications indicated by sealer manufacturer based on field experience and laboratory testing.

B. U.S. Gypsum Company: Thermafiber Safing Insulation complete with U.S.G. impaling clips for slab edges and fire retardant adhesive.

C. The Carborundum Company Fibers Division: Fiberfrax Durablanket with fire retardant adhesive.

D. Thermal Ceramics: FireMaster Blanket with fire retardant adhesive.

2.04 FIRE AND SMOKE BARRIER CALK

A. 3M Brand CP 25 N/S and CP 25 S/L Fire Barrier Caulk, or 3M Brand Fire Barrier Putty 303.

2.05 FIRE BARRIER WRAP/STRIP

A. 3M #FS-195 wrap/strip.

2.06 SHEET METAL RESTRICTING COLLARS

A. 3M Restricting Collar #RC-1. Provide suitable galvanized bolts and expansion anchors.

2.07 HOSE CLAMPS FOR RESTRICTING COLLARS

A. Standard galvanized steel or stainless steel hose clamps sized to fit over collars.

2.08 ALUMINUM FOIL TAPE

A. 3M #425 foil tape.

2.09 FIRE BARRIER PARTITIONS AND COVERS

A. 3M type PSS-7904 R device complete with front and back covers of 3M composite sheet CS-195, all necessary related galvanized steel supports, cover plates and fastenings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.02 GENERAL

A. Apply fire-safing insulation and fire and smoke barrier caulk, fire barrier wrap/strips and partitions in accord with manufacturer's published installation details, directions, U.L. classified fire test data and as specified hereinafter.

3.03 PREPARATION

A. Masonry, plaster and concrete surfaces shall be smooth, clean and free of loose debris, holes and projections.

3.04 WALL PENETRATIONS - METAL PIPES, CONDUITS, AND HVAC DUCT PERIMETERS

A. Where gaps between metal pipes, conduits, duct openings are 1/4 inch or less: Seal gaps with specified fire and smoke barrier caulk.

B. Where gaps between metal pipes and ducts are more than 1/4 inch:
   1. Pack space between opening and pipe, conduit and duct with specified fire-safing insulation and of depth of insulation to provide a (1) (2) hour rating for partitions as indicated in accord with fire-safing manufacturer's directions.
   2. Apply specified fire and smoke barrier caulk of required (½) (1) inch uniform depth over fire-safing insulation support. Smooth surface of calk at exposed areas.
   3. In place of specified fire and smoke barrier caulk, provide fire and smoke barrier wrap/strips, wire tied in place and covered with 1/4 inch of specified fire and smoke barrier calk in accord with manufacturer's directions.

3.05 FIRE WALL PENETRATIONS - PLASTIC PIPE AND CONDUIT PERIMETERS AND INSULATED METAL PIPE PERIMETERS

A. Where gaps between plastic pipes and plastic conduits and wall openings are 1/4 inch or less and where insulated metal pipes occur, provide 3M fire barrier restricting collar PC-1, FS-195 wrap/strip with 3M fire and smoke barrier caulk on both sides of wall and at bottom of floor only to provide (1) (2) hour fire resistance for partitions and (1) (2) (3) hour fire resistance for fire walls as indicated in accordance with manufacturer's directions.
   1. Provide number of wrap/strips around pipes and conduits in accordance with wrap/strip manufacturer's tables. Wrap/strip shall extend 3/16 inch minimum past floor and wall opening.
   2. Enclose wrap/strips with sheet metal restricting collars bolted to each side of wall for fire wall penetrations. Bend support tabs back to pipe or insulation and secure collar with metal hose clamp.
   3. Seal all seams and edges at wall with 1/4 inch bead of specified fire and smoke barrier caulk.

B. Plastic pipe and insulated cable penetrations to fire walls:
   1. Provide galvanized steel pipe sleeves equivalent to EMT, sized to allow annular space of not less than 3/4 inch around pipe or cable. Project pipe sleeve 3 inch on each side of wall. Tightly fit pipe sleeves to wall. Grout sleeves into masonry.
   2. Fill space around pipe and cable to within 2-1/4 inch of end of pipe sleeve with fire-safing insulation.
   3. Place 3M #425 aluminum foil tape around plastic pipe located so that half of tape will be covered by fire barrier wrap/strips.
   4. Provide number of specified fire barrier wrap/strips around pipes and cable on each side of wall in accordance with wrap/strip manufacturer's table to provide (1) (2) hour fire resistance for partitions and (1) (2) (3) hour fire resistance for fire

walls as indicated in accord with wrap/strip manufacturer's directions. Wire wrap/strips in place and slide into pipe sleeve, recessing 1/4 inch.

5. Cover surface of wrap/strip around pipe and cable with uniform 1/4 inch depth of specified fire and smoke barrier caulk. Caulk shall abut aluminum foil tape on pipe and pipe sleeve at penetration perimeter.

3.06 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 sealers and of products in which joints occur.

3.07 PROTECTION

A. Protect joint sealers 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 sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION

SECTION 07920

SEALANTS, CAULKINGS AND SEALS

PART l GENERAL

l.0l SECTION INCLUDES

A. Exterior sealants including following locations and as required to make buildings weatherproof:

1. Exterior joints around door frames and wall louvers.
2. Exterior thresholds, front edges, rear edges, ends and screws.
3. Perimeter joints at electrical and mechanical items penetrating walls, floors, ceilings and roofs.
4. Locations indicated on the drawings and where required to make joints weathertight.

B. Interior sealants including following locations to seal joints:

1. Expansion joints at perimeter of ceramic floor tile areas, intermediate joints and joints at interior corners in tiled wall and base areas.
2. Joints between sink and vanity countertops / backsplashes and other building surfaces using silicone sealant. Bedding sealant for drop in type sinks and lavatories using silicone sealant.
3. Joints between walls and plumbing fixtures such as sinks, lavatories, and urinals using silicone sealant.

C. Interior Caulking Locations using Latex Caulking:

1. Joints between interior door frames and interior window frames and gypsum wallboard, plaster and masonry.
2. Non-moving non-traffic joints between painted interior surfaces.

l.02 RELATED WORK

A. 08100 – Metal Doors and Frames
B. 08210 – Wood Doors
C. 09200 - Gypsum Drywall Systems
D. 09300 - Ceramic Tile
E. 09900 - Painting.

1.03 SUBMITTALS

A. Submit for review, properly identified product data, with names, catalog numbers, specifications, surface preparation, primers required for each different type of surface,

mixing and application directions for each product.

B. Samples:

1. Submit sealant manufacturer's full color range charts for selection by Architect.
2. Submit for review, small samples of each type of joint backing rod, sealant and bond breaker tape.

1.04 WARRANTY

A. Provide warranty covering sealant materials and workmanship for a two-year period covering joint failure. Joint failure is defined as: Leaks of air or water; evidence of loss of cohesion; cracking or splitting; fading of sealant material; migration of sealant; evidence of loss of adhesion between sealant and joint edge.

B. Warranty shall be signed by Contractor and waterproofing installer.

PART 2 PRODUCTS

2.01 PRIMERS

A. As provided by sealant manufacturer, designed to insure adhesion of sealant for each type of surface encountered.

2.02 URETHANE SEALANT FOR TRAFFIC JOINTS

A. ASTM C920, Type S (single component) or Type M (multi-component); Grade P (pourable) or Grade NS (nonsag); Class 25, use T and M; and of colors as selected by Architect from manufacturer's standard color chart.

B. Acceptable Manufacturers and Brands, Subject to Compliance With Requirements:
1. Tremco: THC 900 or Dymeric.
2. Pecora: Urexpan NR-200 or NR-201.
3. Sonneborn: Sonolastic SL-1 Paving Joint Sealant.

2.03 MILDEW RESISTANT SILICONE SEALANT FOR INTERIOR WET AREAS

A. ASTM C920, Type S (single component); Grade NS (nonsag); Class 25; use NT, G and A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide; intended for sealing interior joints with nonporous substrates and subject to in service exposure to conditions of high humidity and temperature extremes; and of colors as selected by Architect from manufacturer's standard color chart.

B. Acceptable Manufacturers and Brands, Subject to Compliance With Requirements:
1. Tremco: Proglaze White.
2. Pecora: 863, 345 White.

3. Sonneborn: OmniPlus.
4. General Electric: SCS 1702 Sanitary.
5. Dow: Dow Corning 786.

2.04 URETHANE OR SILICONE SEALANT FOR ALL OTHER NON-TRAFFIC JOINTS

A. ASTM C920, Type S (single component) or Type M (Multi-component); Grade NS (nonsag); Class 25; use NT, M, G and A; and of colors as selected by Architect from manufacturer's standard color chart.

B. Acceptable Manufacturers and Brands, Subject to Compliance With Requirements:
   l. Tremco: Dymeric.
   2. Pecora: Dynatrol I or Dynatrol II.
   3. Sonneborn: Sonolastic NPI or NPII.
   4. General Electric: Silpruf Weatherproofing Sealant.
   5. Dow: Dow Corning 790 Silicone Building Sealant, Dow Corning 795 Silicone Building Sealant, or Dow Corning 999 Silicone Glazing Sealant.
   6. Mameco: Vulkem 116 and Vulkem 922.

2.05 LATEX CALKING COMPOUND

A. For interior non-moving joints on and between field painted surfaces:

B. Acceptable Manufacturers and Brands, Subject to Compliance With Requirements:

   1. DAP: Latex Caulk.
   2. Sonneborn: Sonolac Acrylic Latex.
   3. SCM Glidden Coatings and Resins: Macco Latex.
   4. Tremco: Acrylic Latex Caulk.
   5. Pecora: AC-20 Acrylic Latex Calk.

2.06 MODIFIED ACRYLIC LATEX ACOUSTICAL AND INSULATING SEALANT

A. ASTM C920, Type S (single component) or Type M (multi-component); Grade NS (nonsag); Class 25; use NT, M, A and O; and of colors as selected by Architect from manufacturer’s standard color chart.

B. Acceptable manufacturers and brands, subject to compliance with requirements:

   1. Tremco: Dynemeric 511.
   2. Pecora: AC-20 FTR.
   3. Or accepted equivalent.

2.07 BACKER ROD

A. Closed cell foam rod of polyethylene, butyl neoprene or other material that will not

bond to sealant, 25 to 50 percent larger in diameter than joint width.

2.08 BOND BREAKER TAPE

A. Polyethylene type of widths to suit joints. Provide over joint fillers other than polyethylene type.

PART 3 EXECUTION

3.0l PREPARATION

A. Cleaning: Clean joints of mortar, dirt, oil, release agents, curing compounds, water repellants, and other materials that may reduce bond of sealant to substrate materials. Remove water and cause moisture film to dry thoroughly before applying sealant.

1. For repair and remodeling work, remove damaged, loose and deteriorated sealants and back up material form joints.

B. Priming: Prime joint surfaces as recommended by sealant manufacturer for each substrate.

C. Masking: Apply masking tape to adjacent surfaces to protect from over application of sealant. Strip tape immediately after joints have been sealed and tooled.

3.02 JOINT BACKING

A. Where indicated, provide traffic type joint sealant over compatible non-asphaltic type joint filler specified in Section 03300 Cast-In-Place Concrete. Coordinate proper depth of joint recess above joint fillers.

B. Provide backer rod joint filler in other horizontal joints subject to foot and vehicular traffic, at a distance beneath slab surface of l/2 the joint width.

C. Omit joint backing from joints in ceramic tile floors, which are less than l/2 inch deep if the joints are filled fully with sealant.

D. Provide backer rod in all other sealed joints at a depth that will permit application of sealant in an hourglass profile with a depth at neck l/2 the joint width, but in no case more than l/2 inch.

E. Whatever the joint size or substrate, provide backer rod or bond breaker tape as necessary at back of sealant to prevent bonding. Exceptions: Sawed concrete joints; items bedded in sealant such as thresholds.

3.03 MIXING

A. Mix multi-component sealants according to manufacturers' published recommendations. Observe limitations on pot life and temperature of application.

3.04 APPLICATION OF SEALANTS

A. Seal joints only when joints are fully clean and free of moisture. Do not apply sealants under dusty or moist atmospheric conditions.

B. Seal joints in traffic joints at interior and exterior and seal unfilled expansion joints in paver tile, quarry tile, concrete paving and ceramic tile of building by filling level with joint top, leaving surface flat or concave, not convex.

C. Seal other joints by applying a constant bead of sealant from a nozzle that just fits joint width. Compress the sealant bead to fill the entire joint profile formed by the joint backing and so as to fully engage both sides of the joint.

D. The sealant bead shall be free of ripples, sag, tool marks, tears and gaps. Slick the bead as needed to make smooth and continuous from side to side.

3.07 CLEANING

A. Clean adjacent surfaces free of sealant, calking and soiling using solvent or cleaning agent before sealant cures as recommended by the manufacturer.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

1.2 SUBMITTALS

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

Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

Product Data for Credit MR 5.1 and Credit MR 5.2: For products having regional content, documentation indicating percentages by weight of regional content defined as being extracted and manufactured within 500 miles of the project site. Include statement indicating costs for each product having recycled content.

B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required.

E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

F. Contractor shall provide all Miami-Dade County product approvals and NOA's.

1.3 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at according to NFPA 252 or UL 10C.

B. Fire-Rated, Borrowed-Light Frame 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, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

D. Shall be Miami-Dade County approved products and meet all NOA requirements.

E. Doors for security/secured areas shall meet all industry standards for holding rooms, security rooms and such. Contractor shall submit all shop drawings for review and approval.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Kewanee Corporation (The).
10. Mesker Door Inc.
11. Pioneer Industries, Inc.
12. Security Metal Products Corp.
13. Steelcraft; an Ingersoll-Rand company.
14. Windsor Republic Doors.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I.

H. Glazing: Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat.

J. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60%.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Comply with ANSI/SDI A250.8.

1. Design: Flush panel As indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Doors: R-value of not less than 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W) when tested according to ASTM C 1363.

3. Vertical Edges for Single-Acting Doors: Beveled edge, 1/8 inch in 2 inches (3 mm in 50 mm)..
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 4 and Physical Performance Level A (Maximum Duty), Model 2 (Seamless).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level. Minimum guage for metal doors shall be as outlined in the Schedule:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
2. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
3. Level 4 and Physical Performance Level A (Maximum Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as knocked down or full profile welded in masonry openings unless otherwise indicated.
3. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
4. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
5. Frames for Level 4 Steel Doors: 0.067-inch- (1.7-mm-) thick steel sheet.
6. Frames for Wood Doors: 0.067-inch- (1.7-mm-) thick steel sheet.
7. Frames for Borrowed Lights: 0.067-inch- (1.7-mm-) thick steel sheet or Same as adjacent door frame.

D. Hardware Reinforcement: ANSI/SDI A250.6.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, same material as door face sheet.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, same material as frames.

D. Terminated Stops: Where indicated, terminate stops 6 inches (152 mm) above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

2.8 LOUVERS

A. Provide lightproof louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

1. Fire-Rated Automatic Louvers: Movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.

2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

2.10 FABRICATION

A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

B. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
4. All doors requiring electric hardware shall be prepared and ready for electric equipment.

C. Hollow Metal Frames: Where frames are fabricated in sections, 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. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
        5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.

    a. Single-Door Frames: Three door silencers.
    b. Double-Door Frames: Two door silencers.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite are capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.11 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: ANSI/SDI A250.10.

B. Factory-Applied Paint Finish: ANSI/SDI A250.3.

1. Color and Gloss: Match Architect's sample As selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field applies bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

B. Hollow Metal 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 (3 mm) plus or minus 1/16 inch (1.6 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.2 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 hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with plastic-laminate faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in doors.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include factory-finishing specifications.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

    a. Include statement indicating costs for each certified wood product.

2. Product Data for Credit EQ 4.4: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate doors to be factory finished and finish requirements.
4. Indicate fire-protection ratings for fire-rated doors.

D. Samples: For plastic-laminate door faces.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated." WDMA I.S.1-A, "Architectural Wood Flush Doors." WI's "Manual of Millwork."

C. Forest Certification: Provide doors made with cores not less than 70 percent of wood products all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

D. All doors shall be prepped and ready for electrical hardware equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following provided they meet all minimum criteria as specified herein subject to the approval of the Architect.:

1. Algoma Hardwoods, Inc.
2. Ampco, Inc.
3. Buell Door Company Inc.
4. Chappell Door Co.
5. Eagle Plywood & Door Manufacturing, Inc.
6. Eggers Industries.
7. Graham; an Assa Abloy Group company.
8. Haley Brothers, Inc.
9. Ideal Architectural Doors & Plywood.
10. Lambton Doors.
11. Marlite.
12. Marshfield Door Systems, Inc.
13. Mohawk Flush Doors, Inc.; a Masonite company.
14. Oshkosh Architectural Door Company.
15. Poncraft Door Company.
16. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: public toilets janitor's closets and where indicated.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2 , made with binder containing no urea-formaldehyde resin.

2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

2.3 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products.
4. Exposed Vertical Edges: Plastic laminate that matches faces.
5. Core: Structural composite lumber.
6. Construction: Three plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces are applied.
7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces and crossbands are applied.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

1. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, with baked-enamel- or powder-coated finish.
2. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Mechanical door hardware for the following:
      a. Swinging doors.
      b. Sliding doors.
      c. Folding doors.
   2. Cylinders for door hardware specified in other Sections.
   3. Electrified door hardware.
   4. All required and coordinated hardware/equipment and power supplies shall be provided by Door Manuf. and contractor for complete door system and operation.

B. Related Sections:
   1. Division 06 Section "Interior Architectural Woodwork" for cabinet door hardware provided as part of architectural woodwork.
   2. Division 08 Section "Hollow Metal Doors and Frames"
   3. Division 08 Section "Flush Wood Doors".
   4. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, [except cylinders.
   5. Division 12 Sections for cabinet door hardware provided as part of casework.
   6. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
   7. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security system.
   8. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion-detection system.
   9. Division 28 Section "Digital, Addressable Fire-Alarm System" for connections to building fire-alarm system.
   10. Division 28 Section "Zoned (DC Loop) Fire-Alarm System" for connections to building fire-alarm system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, Miami Dade County Approvals (NOAs), dimensions of individual components and profiles, and finishes. Product Data for Credit MR 4.1 and Credit

MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

B. Shop Drawings: Details of electrified door hardware, indicating the following:
   1. Wiring Diagrams: For power, signal, and control wiring and including the following:
      a. Details of interface of electrified door hardware and building safety and security systems.
      b. Schematic diagram of systems that interface with electrified door hardware.
      c. Point-to-point wiring.
      d. Risers.
      e. Elevations doors controlled by electrified door hardware.
   2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.

D. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
   1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch) long Samples for other products.
      a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

E. Other Action Submittals:
   1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
      a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
      b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
      c. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.

d. Content: Include the following information:
   1) Identification number, location, hand, fire rating, size, and material of each door and frame.
   2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
   3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
   4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
   5) Fastenings and other pertinent information.
   6) Explanation of abbreviations, symbols, and codes contained in schedule.
   7) Mounting locations for door hardware.
   8) List of related door devices specified in other Sections for each door and frame.
   9) Miami Dade Building Code Compliance: Shall Provide products where indicated with NOA numbers approved by Miami-Dade Building Code Compliance. **ALL EXTERIOR DOORS**

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.

B. Product Certificates: For electrified door hardware, from the manufacturer.
   1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

D. Warranty: Special warranty specified in this Section.

E. Miami Dade Building Code Compliance: Shall Provide products where indicated with NOA numbers approved by Miami-Dade Building Code Compliance.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
   1. Warehousing Facilities: In Project's vicinity.
   2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
   3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
   4. Miami Dade Building Code Compliance: Shall Provide products where indicated with NOA numbers approved by Miami-Dade Building Code Compliance. **ALL EXTERIOR DOORS**

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
   1. For door hardware, an Architectural Hardware Consultant (AHC) .

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines ICC/ANSI A117.1
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

I. 1. Comply with the following maximum opening-force requirements.
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   2. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high for exterior sliding doors].
   3. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

J. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
   1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Requirements for access control.
   5. Address for delivery of keys.

K. Pre-installation Conference: Conduct conference as directed by Architect.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Inspect and discuss preparatory work performed by other trades.
   3. Inspect and discuss electrical roughing-in for electrified door hardware.
   4. Review sequence of operation for each type of electrified door hardware.
   5. Review required testing, inspecting, and certifying procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of doors and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
   2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
      a. Exit Devices: Two years from date of Substantial Completion.
      b. Manual Closers: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

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

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" to comply with requirements in this Section.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products
   2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
   2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.
   3. Miami Dade Building Code Compliance: Provide products where indicated with NOA numbers approved by Miami-Dade Building Code Compliance .

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Bommer Industries, Inc.
      b. Hager Companies.
      c. IVES Hardware; an Ingersoll-Rand company.
      d. McKinney Products Company; an ASSA ABLOY Group company.

2.3 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
   1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
   2. Deadbolts: Minimum 1-inch bolt throw.

C. Lock Backset: 2-3/4 inches unless otherwise indicated.

D. Lock Trim:
   1. Description: As indicated on Drawings.
   2. Levers: Cast.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
   4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

F. Mortise Locks: BHMA A156.13; Operational, Security Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule, comparable product by one of the following:
      a. Accurate Lock & Hardware Co.
      b. Best Access Systems; Div. of Stanley Security Solutions, Inc.
      c. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
      d. Marks USA.
      e. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
      f. Schlage Commercial Lock Division; an Ingersoll-Rand company.
      g. Yale Security Inc.; an ASSA ABLOY Group company.

2.4 AUXILIARY LOCKS

A. Mortise Auxiliary Locks: BHMA A156.5; Grade[**1**; with strike that suits frame.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Accurate Lock & Hardware Co.
      b. Arrow USA; an ASSA ABLOY Group company.
      c. Best Access Systems; Div. of Stanley Security Solutions, Inc.
      d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
      e. Schlage Commercial Lock Division; an Ingersoll-Rand company.
      f. Yale Security Inc.; an ASSA ABLOY Group company.

2.5 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; Grade 1; motor or solenoid driven; mortise latchbolt; with strike that suits frame.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
      b. Brink, R. R., Locking Systems, Inc.
      c. DynaLock Corp.
      d. Hager Companies
      e. Rutherford Controls Int'l. Corp.
      f. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
      g. Schlage Commercial Lock Division; an Ingersoll-Rand company.
      h. Security Door Controls.
      i. Yale Security Inc.; an ASSA ABLOY Group company.

2.6 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge. See Division 01 Section "Product Requirements."
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Door Controls International, Inc.
      b. IVES Hardware; an Ingersoll-Rand company.
      c. Trimco.
      d. Hager Companies
      e. Rockwood

2.7 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
   1. Manufacturer: Same manufacturer as for locking devices.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.

B. High-Security Lock Cylinders: BHMA A156.30; Grade 1; Type M, mechanical]; permanent cores that are removable; face finished to match lockset.

C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
   1. No Master Key System: Only change keys operate cylinder.
   2. Master Key System: Change keys and a master key operate cylinders.
   3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
   4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
   5. Existing System:
      a. Master key or grand master key locks to Owner's existing system.
      b. Re-key Owner's existing master key system into new keying system.
   6. Keyed Alike: Key all cylinders to same change key.

B. Keys: Nickel silver.
   1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
      a. Notation: "DO NOT DUPLICATE."
   2. Quantity: In addition to one extra key blank for each lock, provide the following:
      a. Cylinder Change Keys: Three.
      b. Master Keys: Five.
      c. Grand Master Keys: Five.
      d. Great-Grand Master Keys: Five.

2.9 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. American Key Boxes and Cabinets.
      b. GE Security, Inc.
      c. HPC, Inc.
      d. Lund Equipment Co., Inc.
      e. MMF Industries.
      f. Tri Palm International.
   3. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

B. Cross-Index System: Multiple-index system for recording key information. Include three receipt forms for each key-holding hook. Set up by Installer.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Lund Equipment Co., Inc.
      b. MMF Industries.
      c. Tri Palm International.

2.10 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release and with internal override.

B. Astragals: BHMA A156.22.

C. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
      b. LCN Closers; an Ingersoll-Rand company.
      c. Norton Door Controls; an ASSA ABLOY Group company.
      d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.

2.11 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
      a. Architectural Builders Hardware Mfg., Inc.
      b. Burns Manufacturing Incorporated.
      c. Don-Jo Mfg., Inc.
      d. Door Controls International, Inc.
      e. Hager Companies.
      f. Hiawatha, Inc.
      g. IVES Hardware; an Ingersoll-Rand company.

h. Rockwood Manufacturing Company.
i. Stanley Commercial Hardware; Div. of The Stanley Works.
j. Trimco.

2.12 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
a. Architectural Builders Hardware Mfg., Inc.
b. Glynn-Johnson; an Ingersoll-Rand company.
c. Rockwood Manufacturing Company.
d. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
e. Hager Companies

2.13 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
a. Hager Companies.
b. National Guard Products.
c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
d. Reese Enterprises, Inc.
e. Sealeze; a unit of Jason Incorporated.
f. Zero International.

2.14 THRESHOLDS

BHMA A156.21; fabricated to full width of opening indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on schedule or comparable product by one of the following:
a. Hager Companies.
b. National Guard Products.
c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
d. Reese Enterprises, Inc.
e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

f. Sealeze; a unit of Jason Incorporated.
g. Zero International.

2.15 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on[schedule or comparable product by one of the following:
a. Burns Manufacturing Incorporated.
b. Don-Jo Mfg., Inc.
c. Hiawatha, Inc.
d. IVES Hardware; an Ingersoll-Rand company.
e. Rockwood Manufacturing Company.
f. Trimco.
g. Hager Companies.

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door ardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
a. Wood or Machine Screws: For the following:
1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
2) Strike plates to frames.
3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:
   1) Surface hinges to doors.
   2) Closers to doors and frames.
   3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
   3. All required and coordinated hardware/equipment and power supplies shall be provided by Door Manuf. and contractor for complete door system and operation.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.
   2. Furnish permanent cores to Owner for installation.

E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, Verify location with Architect.
   1. Configuration: Provide one power supply for each door opening, least number of power supplies required to adequately serve doors with electrified door hardware.

G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

Manufacturers;
HAG – Hager Companies
LCN – LCN

MED – Medeco
PEM – Pemko
SDC – Security Door Controls
SS – Southern Steel
SFA – Southern Folger Adams

Heading 1

Door # 001, 002, 003, 100, 103, 104
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Cylinder	Mortise/Rim	626	MED

Remainder of hardware by door supplier

#001, 002, 003 – card reader, electric “strike” exit panic device, balanced magnetic switch

#003, 103 – automatic door opening, controlled

001, 002, 003, 103 – electrified 3 point exit panic device (Basis of Design and meeting door NOA: Von Duprin 3-point “chexit” controlled exit device [15 sec delay- which shall be adjusted to meet Fire Marshall’s requirements])

104 – electrically controlled

All doors to be Kawneer 350IR or city approved equal. All required and coordinated hardware/equipment and power supplies shall be provided by Door Manuf. and contractor for complete door system and operation.

Heading 1A

Door # 110
Each opening to receive

Qty	Type	Description	Finish	
8 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 set	Automatic Flushbolts	292D	626	HAG
1 ea.	Dustproof Strike	280X	626	HAG
1 ea.	Classroom Lockset	3870xLCxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
2 ea.	Closers	4041	689	LCN
2 ea.	Overhead Stops	7016 x CON	630	HAG
1 ea.	Coordinator	297D	600	HAG
2 ea.	Kickplates	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Astragal	835S	600	HAG
1 ea.	Magnetic Lock	1512	628	SDC

1 ea.	Coordinator Kit	DC-2	600	SDC
1 ea.	Push Button	413NU	630	SDC
1 ea.	Power Supply	2908		HAG

Card reader (2) by security vendor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, magnetic lock releases allowing entry
Door relocks upon closing
Egress by push button at work station or card reader
Door remains closed and unlocked during power failure or fire alarm activation (fail safe)

Heading 1B

Door # 101
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” ETW	630	HAG
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Electrified Lockset	3881xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 2

Door # 004, 006
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Exit Panic Device	4501 x RIM	630	HAG
1 ea.	Electrified Exit Trim	45ETx EU x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Weatherstrip	881SN	MIL	HAG
1 ea.	Drip Guard	810S	MIL	HAG
1 ea.	Astragal	3572PP7 x COFS*	600	PEM
1 ea.	Power Supply	2903		HAG

*Special drill pattern for thru bolts

Card reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases allowing entry
Door relocks upon closing
Free egress all times (Exit Panic Device)
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 3

Door # 005
Each opening to receive

Qty	Type	Description	Finish	
4 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Storeroom Lockset	3881 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Weatherstrip	881SN	MIL	HAG
1 ea.	Drip Guard	810S	MIL	HAG
1 ea.	Astragal	3572PP7 x COFS*	600	PEM

*Special drill pattern for thru bolts

Heading 4

Door # 105, 106
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5	630	HAG
1 ea.	Keyed Privacy Lock	3856 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Mop Plate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
3 ea.	Silencers	307D	GREY	HAG

Heading 5

Door # 135
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 5A

Door # 130
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card reader by security vendor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 6

Door # 143
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Entry Lockset	3856 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 7

Door # 144
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Entry Lockset	3856xLCxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG

1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 8

Door # 140, 141
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Storeroom Lockset	3881 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Mop Plate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
3 ea.	Silencers	307D	GREY	HAG

Heading 8A

Door # 113, 114
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Keyed Privacy Lock	3856 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
3 ea.	Silencers	307D	GREY	HAG

Heading 9

Door # 142
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Entry Lockset	3856xLCxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 10

Door # 138
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Storeroom Lockset	3881 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 11

Door # 137
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Storeroom Lockset	3880 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041-S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
3 ea.	Silencers	307D	GREY	HAG

Heading 12

Door # 136
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	By Others		
1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card reader by security vendor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases allowing entry

Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 13

NOT USED

Heading 14

Door # 134
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	By Others		
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card Reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 15

Door # 133
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG

1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	747SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card Reader by security vendor
Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 16

NOT USED

Heading 17

Door # 132
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card Reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 18

Door # 131

Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Entry Lockset	3856xLCxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 19

Door # 111
Each opening to receive

Qty	Type	Description	Finish		
1 ea.	Electrified Hinge	BB1191 x 4.45” x 4.5”x ETW	630	HAG	TORX Screws
2 ea.	Hinges	BB1191 x 4.5” x 4.5” x TORX	630	HAG	
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG	
1 ea.	Cylinder	32T0200 x CP180021	626	MED	
1 ea.	Closer	4041	689	LCN	
1 ea.	Overhead Stop	7016 x SRF	630	HAG	
1 ea.	Kickplate	194S	630	HAG	
1 ea.	Threshold	416S	MIL	HAG	
1 ea.	Auto Door Bottom	743SN	MIL	HAG	
1 ea.	Gasket	726S	CHA	HAG	
1 ea.	Power Supply	2908		HAG	

Card Reader by security vendor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 20

Door # 112
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Storeroom Lockset	3880 x LC x SECT x WTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Threshold	416S	MIL	HAG

1 ea.	Auto Door Bottom	743SN	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG

Heading 21

Door # 115
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card Reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 22

Door # 116
Each opening to receive

Qty	Type	Description	Finish		
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG	TORX screws
1 ea.	Storeroom Lockset	3880xLCxSECTxWTS	630	HAG	
1 ea.	Cylinder	32T0200 x CP180021	626	MED	
1 ea.	Kickplate	194S	630	HAG	
1 ea.	Floor Stop	242F	626	HAG	
1 ea.	Threshold	416S	MIL	HAG	
1 ea.	Auto Door Bottom	747SN	MIL	HAG	
1 ea.	Gasket	726S	CHA	HAG	

Duress system by others

Heading 22A

Door # 122
Each opening to receive

Qty	Type	Description	Finish		
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG	TORX screws
1 ea.	Storeroom Lockset	3880xLCxSECTxWTS	630	HAG	
1 ea.	Cylinder	32T0200 x CP180021	626	MED	
1 ea.	Kickplate	194S	630	HAG	
1 ea.	Floor Stop	242F	626	HAG	
1 ea.	Threshold	416S	MIL	HAG	
1 ea.	Auto Door Bottom	747SN	MIL	HAG	
1 ea.	Gasket	726S	CHA	HAG	

Duress system by others

Heading 23

Door # 123
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5”x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5”	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Threshold	416S	MIL	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Power Supply	2908		HAG

Card Reader by security vendor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 24

Door # 121
Each opening to receive

Qty	Type	Description	Finish	
1 ea.	Electrified Hinge	BB1191 x 4.5” x 4.5” x ETW	630	HAG
2 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Electrified Lockset	3880xLCxEUxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041	689	LCN

1 ea.	Kickplate	194S	630	HAG
1 ea.	Wall Stop	232W	630	HAG
1 ea.	Gasket	726S	CHA	HAG
1 ea.	Astragal	3572PP7 x COFS*	600	PEM
1 ea.	Power Supply	2908		HAG

*Special drill pattern for thru bolts

Card Reader by security vendor
Balanced Magnet Switch by security contractor

Description of operation:
Door is normally closed and secure
Upon proper card validation or pin entry, lever releases, allowing entry
Door relocks upon closing
Free egress all times
Door remains closed and locked during power failure or fire alarm activation (fail secure)

Heading 25

Door # 118, 120
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1199 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Deadbolt	1080A w/HM plate		SS
1 ea.	Push	30S x 4” x 16”	630	HAG
1 ea.	Pull	212C	626	SFA
1 ea.	Overhead Stop	7016 x SRF	630	HAG
3 ea.	Silencers	307D	GREY	HAG

Duress System by others

Heading 26

Door # 119
Each opening to receive

Qty	Type	Description	Finish	
3 ea.	Hinges	BB1191 x 4.5” x 4.5” x NRP	630	HAG
1 ea.	Storeroom Lockset	3881xLCxSECTxWTS	630	HAG
1 ea.	Cylinder	32T0200 x CP180021	626	MED
1 ea.	Closer	4041 x S-CUSH	689	LCN
1 ea.	Kickplate	194S	630	HAG
1 ea.	Gasket	726S	CHA	HAG

Balanced Magnet Switch by security contractor

Heading 27

Door # 117
Each opening to receive

Qty	Type	Description	Finish		
3 ea.	Hinges	BB1199 x 4.5” x 4.5” x NRP	630	HAG	TORX screws
1 ea.	Institutional Lockset	3882xLC x LAT	630	HAG	
2 ea.	Cylinders	32T0200 x CP180021	616	MED	
1 ea.	Push Plate	30S x 4” x 16”	630	HAG	
1 ea.	Pull	212C	630	SFA	
1 ea.	Wall Stop	232W	630	HAG	
3 ea.	Silencers	307D	GREY	HAG	

Description of operation:
Door is normally closed and secure
Key retracts latch from either side, allowing entry or egress
Door relocks upon closing

END OF SECTION 087100

SECTION 089000
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum and formed-metal louvers.
2. Wall vents (brick vents).

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

D. Shall be Florida Building Code and Miami-Dade County product approved and have NPA nubmer.

1.3 SUBMITTALS

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

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
   Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural[**and seismic**] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, No. 6 finish.

E. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
3. For fastening stainless steel, use 300 series stainless-steel fasteners.
4. For color-finished louvers, use fasteners with heads that match color of louvers.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Air Balance Inc.; a Mestek company.
b. Air Flow Company, Inc.
c. Airolite Company, LLC (The).

d. All-Lite Architectural Products.
e. American Warming and Ventilating, Inc.; a Mestek company.
f. Arrow United Industries; a division of Mestek, Inc.
g. Construction Specialties, Inc.
h. Greenheck Fan Corporation.
i. Industrial Louvers, Inc.
j. NCA Manufacturing, Inc.
k. Nystrom Building Products.
l. Reliable Products, Inc.
m. Ruskin Company; Tomkins PLC.
n. United Enertech Corp.

2. Louver Depth: 5 inches (125 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
4. Louver Performance Ratings:

   a. Free Area: Not less than 5.0 sq. ft. (0.46 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
   b. Air Performance: As required by the engineer for the design intent.
   c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core-area intake velocity of 400 fpm (2.0 m/s).

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Air Balance Inc.; a Mestek company.
   b. Air Flow Company, Inc.
   c. Airolite Company, LLC (The).
   d. All-Lite Architectural Products.
   e. American Warming and Ventilating, Inc.; a Mestek company.
   f. Arrow United Industries; a division of Mestek, Inc.
   g. Carnes Company, Inc.
   h. Cesco Products; a division of Mestek, Inc.
   i. Construction Specialties, Inc.
   j. Dowco Products Group; Safe-Air of Illinois, Inc.
   k. Greenheck Fan Corporation.
   l. Industrial Louvers, Inc.
   m. Louvers & Dampers, Inc.; a division of Mestek, Inc.
   n. Metal Form Manufacturing Inc.
   o. NCA Manufacturing, Inc.
   p. Nystrom Building Products.
   q. Reliable Products, Inc.
   r. Ruskin Company; Tomkins PLC.
   s. United Enertech Corp.
   t. Vent Products Company, Inc.

2. Louver Depth: 6 inches (150 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
4. Louver Performance Ratings:
   a. As required by the engineer for the design intent.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:
1. Bird Screening: Stainless steel, 1/2-inch- (13-mm-) square mesh, 0.047-inch (1.19-mm) wire.

2.5 WALL VENTS (BRICK VENTS)

A. Extruded-Aluminum Wall Vents:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Air Flow Company, Inc.
   b. Airolite Company, LLC (The).
   c. Arrow United Industries; a division of Mestek, Inc.
   d. Construction Specialties, Inc.
   e. Dowco Products Group; Safe-Air of Illinois, Inc.
   f. Greenheck Fan Corporation.
   g. Hohmann & Barnard, Inc.
   h. Industrial Louvers, Inc.
   i. Louvers & Dampers, Inc.; a division of Mestek, Inc.
   j. Metal Form Manufacturing Inc.
   k. Nystrom Building Products.
   l. Reliable Products, Inc.
   m. Ruskin Company; Tomkins PLC.
   n. Sunvent Industries; Division of Sylro Sales Corp.
   o. United Enertech Corp.

2. Extruded-aluminum louvers and frames, not less than 0.125-inch (3.18-mm) nominal thickness, assembled by welding; with 18-by-14- (1.4-by-1.8-mm-) mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.

2.6 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect.

B. High-Performance Organic Finish: Color and Gloss: As selected by Architect.

2.7 GALVANIZED-STEEL SHEET FINISHES

A. Finish louvers after assembly.

B. 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 repair according to ASTM A 780.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for 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: As selected by Architect.

2.8 STAINLESS-STEEL SHEET FINISHES

A. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 089000

SECTION 09290

GYPSUM DRYWALL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gypsum wallboard construction as indicated on drawings including metal stud partition framing members; fire resistant rated; metal wall furring; suspended metal ceiling furring; gypsum wallboard, gypsum board wall system for the enclosure of shafts; moisture resistant gypsum board, and tile backer board screw fastened to metal framing and furring; and necessary accessories indicated on drawings and specified in this section.

l.02 RELATED SECTIONS

A. 01330 - Submittal Procedures
B. 02070 - Selective Demolition.
C. 06100 - Rough Carpentry (Wood Furring, where indicated; Grounds and Blocking).
D. 09300 - Ceramic Tile.
E. 09900 - Painting.

l.03 SUBMITTALS

A. Submit properly identified product data including material specifications and printed installation directions for system.

B. Manufacturer's U.L. design for each item of construction, where fire rated partitions, enclosures of shafts and ceilings are indicated.

l.04 QUALITY ASSURANCE

A. Unless otherwise specified, comply with applicable requirements of governing codes and authorities and ANSI A97.2.

B. Comply with fire-resistance ratings as required by governing authorities and codes. Materials must be listed by Underwriters' Laboratories or tested in accord with ASTM Ell9.

C. All components of gypsum board systems shall be by one manufacturer or compatible.

D. All finish wallboard work will be subject to inspection using a lighting level of not less than fifty foot candles at surface of gypsum wallboard. Surfaces judged by Architect to be unsuitable for finishing, whether or not finishes have been applied, will be rejected.

1. Architect will direct repair or replacement of rejected work.

l.05 ENVIRONMENTAL CONDITIONS

A. Proceed with installation of gypsum board materials only after building is weather-tight.

B. Maintain temperature in areas receiving gypsum board materials between 50 degrees and 90 degrees F. during and subsequent to installation and provide adequate ventilation for drying joint and fastening treatment compounds.

C. Comply with ASTM C840 requirements for shaft wall system.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Following manufacturers are acceptable subject to compliance with specifications:
1. Georgia - Pacific Corp.
2. National Gypsum Co.
3. United States Gypsum Co.

2.02 METAL STUD FRAMING MEMBERS

A. Metal Studs: ASTM C645; screw type, roll formed galvanized steel, 25 gage and 20 gage as indicated or as specified, depths as indicated for new work and as required to match existing for remodeling work.

B. Floor and Ceiling Runners: 25 gage galvanized steel; width as required to suit screw studs. Ceiling runners for partitions terminating at underside of structural deck shall be long leg type 1-1/4 inch flange depth minimum. Where indicated, provide custom fabricated floor runners of special height as indicated and of width as required to suit screw studs.

C. Shaft wall I-Stud (1/2 inch less than ceiling height).

2.03 METAL WALL FURRING (For insulated walls)

A. ZEE Furring: (25 gage) (20 gage) galvanized steel furring, with 7/8 inch minimum wall flange by (1) inch depth required to fit wall insulation indicated.

2.04 METAL FRAMING FOR SUSPENDED CEILINGS AND SOFFITS

A. Ceiling Hanger Wire Tie Inserts For Cast-In-Place Concrete Slabs:
1. Heckman Building Products Inc.: No. 461, of galvanized steel.

B. Ceiling Hanger Wire Tie Concrete Expansion Bolts For Existing Concrete Slabs:

1. ITW Ramset/Redhead: No. TW-1614 drilled in sleeve type.
2. Star: No. 3411-3 self drilling type.
3. Phillips: T-32.

C. Hangers: Galvanized, annealed, pre-straightened steel wire, No. 8 gage where supporting up to l2.5 square feet of ceiling, and No. 6 gage where supporting up to l6 square feet of ceiling.

D. Channel Tie Wire: l6 gage galvanized soft annealed steel wire.

E. Channel Clips: Galvanized wire designed to attach furring channels to l-l/2 inch main runners.

F. Main Runners: Cold-rolled painted steel channels, l-l/2 inch x .475 pounds per foot and 2 inch x l.26 pounds per foot as required by Table 2.

G. Cross Furring: ASTM C645, 25 gage hat shaped galvanized steel furring channel; 7/8 inch deep x l 3/8 inch face width.

H. Metal Screw Stud Furring: ASTM C645; screw type, roll formed galvanized steel, 25 gage of depths as indicated or as required by Table 2.

2.05 GYPSUM BOARD ACCESSORIES

A. Corner Beads: "Dur-A-Bead" No. l0l manufactured by United States Gypsum; heavy duty, electro-galvanized steel; l inch x l inch.

B. Casing Beads: No. 200 Series manufactured by United States Gypsum; roll formed electro-galvanized steel.

C. Control Joints: No. 093 of roll formed zinc, manufactured by United States Gypsum, with tape protected l/4 inch wide x 7/l6 inch deep opening.

2.06 GYPSUM BOARD

A. Width 48 inches unless otherwise indicated; thicknesses as indicated or as required to match existing for remodeling work; lengths as great as practicable to minimize joints; in accord with ASTM C36 and the following:

B. Regular Gypsum Board: Paper faced surface suitable to receive decorative finish with long edges tapered.

C. Fire Rated Gypsum Board: Type X, with specially formulated mineral core and treated paper face, and with long edges tapered.

D. Gypsum shaft liner (1 inch less than ceiling height).

E. Gypsum Backing Board (For multi layer fire rated use): ASTM C442, or ASTM C36, Type X, with specially formulated mineral core and treated paper face.

F. Water Resistant Gypsum Board: Multi layered chemically treated face and back paper and asphalt composition core in accord with ASTM C630 with long edges tapered.

G. Tile Backer Board At Tiled Walls bath tub and shower areas): Portland cement type with light weight aggregate, 7/16 inch or ½ inch thick by 36 inches wide, lengths as great as practicable to minimize joints.
   1. Acceptable Manufacturers:
      a. United States Gypsum: “Durock”.
      b. Modulars, Inc., P.O. Box 216, Hamilton, Ohio 45012: “Wonder-Board”.
      c. Georgia Pacific Corp.: “Dens-Shield”.

2.07 FASTENERS

A. Gypsum Board Screws: No. 6 self-drilling, cross slot countersunk bugle head, zinc plated, l inch long for single gypsum board layer applied to metal studs, and metal furring and not less than l-5/8 inch long for double layer gypsum board applied to metal studs. Provide l-l/4 inch screws for gypsum board applied to wood furring or blocking.

B. Runner and Metal Furring Fasteners To Concrete: Zinc plated hardened steel stub nails.

C. Runner and Metal Furring Fasteners To Metal Decks: No. 6 self drilling, cross slot pan head, zinc plated, 3/8 inch or l/2 inch long, or as required.

D. Stud and Door Frame Screws: No. 6 self drilling, cross slot pan head, zinc plated, 3/8 inch or l/2 inch long, or as required.

E. Shaft wall accessories:
   1. Rolled steel angle, 2" X 2" by 20 gage.
   2. Screws: comply with ASTM C954 or ASTM C1002 or both with heads, threads, points, and finish as recommended by the manufacturer.

F. Staples for Gypsum Board Accessories: Zinc plated; length as required.

2.08 JOINT TREATMENT MATERIALS

A. Tape and joint compound for embedding and fill coat application and finishing in accord with ASTM C475 and ASTM C840 for shaft wall, ready mixed.

2.09 SOUND ATTENUATION BLANKETS

A. In accord with Fed. Spec. HH-I-52lF, Type l, Class A; thickness as indicated; “Thermafiber” manufactured by U.S. Gypsum Co.; mineral wool blankets or batts

manufactured by National Gypsum Co.; Fiberglass blankets manufactured by Owens-Corning Fiberglass Corp.

2.10 BUTYL ACOUSTICAL SEALER TAPE

A. l/l6 inch by 2 inch, Tremco TAT-l or 3M Brand.

2.11 ACOUSTICAL SEALANT

A. Acrylic or vinyl emulsion type, U.S. Gypsum Acoustical Sealant, or accepted equivalent.

PART 3 EXECUTION

3.01 GENERAL

A. Install gypsum board systems in strict accord with manufacturer's published installation directions, and as specified herein.

3.02 INSTALLATION OF METAL FRAMING FOR GYPSUM BOARD PARTITIONS

A. Install floor and ceiling runners as required; do not miter at corners.

B. Install steel stud members l6 inches o.c., plumb, level, true to line, and secured with proper fasteners in accord with manufacturer's instructions unless otherwise specified.

C. Terminate partitions at underside of decks or existing framing, unless otherwise indicated.

D. Where partitions terminate at underside of structural deck, install long leg type ceiling runners leaving ½ inch space between top of stud and web of ceiling runner to allow for overhead deck deflection. Do not screw studs to ceiling runners where partition extends to underside of structural decks.

E. Secure ceiling runners to concrete structure with hardened stub nails or power driven fasteners at 24 inches on center. Secure ceiling runners to underside of metal decks with self drilling sheet metal screws at 24 inches o.c.

F. Provide additional studs to support inside corners at partition intersections and corners, and to support outside corners, terminations of partitions and both sides of control joints. Provide not less than 3 studs at partition external corners and intersections.

G. Provide 20 gage metal studs at door jambs and at partitions supporting heavy loads such as shelving, wall cabinets, and plumbing fixtures. Provide (25) (20) gage studs at other locations.

H. Coordinate frame openings with hollow metal frames. Provide 20 gage metal studs on each side of door frame openings extended to overhead structure. Framing across top of door frames shall be made of standard floor and ceiling runner with flanges cut and bent 90 degrees at each end. Install short lengths of studs vertically l6 inches o.c. above door frames, with each flange of each stud secured to top and bottom runners. Provide diagonal stud braces in stud panels over openings exceeding 4 feet wide. Fit diagonal stud braces between top and bottom runners and secure each flange at each end to runners.

I. Provide all holes, cut outs and notches in framing members for proper installation of electrical and mechanical items. Provide stud framing fastened in partitions as required for support of electrical boxes, telephone boxes, lights, access doors, and other attached or recessed equipment. Provide all stud and ceiling runner reinforcing or additional studs as required to provide straight, plumb and safe partitions, free from weakness. Where studs are cut for pipe, conduits, and other work, reinforce partitions in accord with manufacturer's directions and details.

J. Where chase walls are indicated thicker than nominal stud depth, provide two rows of metal studs. Studs to be spaced 16 inches o.c. to provide chase wall width desired or as required to accommodate pipes and recessed accessories indicated. Brace each row of studs together with horizontal metal stud sections spaced 24 inches o.c. maximum, attached to each vertical stud.

3.03 INSTALLATION OF METAL SUSPENSION SYSTEM FOR CEILINGS AND SOFFITS

A. TABLE l - SPANS AND SPACINGS OF MAIN RUNNERS

Minimum Size and Type	or Supports	Spacing of Runners
l l/2 in.-0.475 lb. per ft., Cold rolled channel	3 ft. 0 in.	5 ft. 0 in.
l l/2 in.-0.475 lb. per ft., Cold rolled channel	3 ft. 6 in.	4 ft. 6 in.
l l/2 in.-0.475 lb. per ft., Cold rolled channel	4 ft. 0 in.	4 ft. 0 in.
l l/2 in.-l.l2 lb. per ft., Hot rolled channel	4 ft. 0 in.	6 ft. 0 in.
2 in.-l.26 lb. per ft., Hot rolled channel	3 ft. 6 in.	8 ft. 0 in.

B. TABLE 2 - SPANS AND SPACINGS OF FURRING MEMBERS

FURRING MEMBER	FURRING MEMBER SPACING		
Resilient Furring Channel	2'0"	2'0"	2'0"
Furring Channel	4'0"	4'6"	5'0"
l-5/8" Screw Studs	5'0"	5'6"	6'0"
2-l/2" Screw Studs	6'0"	6'6"	7'0"
3-5/8" Screw Studs	8'0"	8'6"	9'0"
4" Screw Studs	8'6"	9'0"	9'6"
6" Screw Studs	8'6"	9'0"	9'6"

C. Hangers:
   1. Location and Spacing: Locate hangers plumb in relation to main runners and avoid contact with insulation covering ducts and pipes. Do not pass hangers through ducts. Space hangers in accord with Table l. Alter spacing of hangers or provide double hangers splayed to avoid ducts and other obstructions but do not exceed maximum allowable ceiling area to be supported by each hanger. Offset horizontal forces of splayed hangers by counter splaying bracing or other suitable means.
   2. Provide extra hangers within 6 inches of ends of main runners, to support light fixtures and as required to support diffusers, grilles, access panels and other items resting in or on the ceilings. At control and expansion joints, provide extra hangers as required to support discontinuous runners.

D. Main Runners: Suspend main runners on hanger wires, level and true. Size and spacing of main runners shall be in accord with Table 1. Saddle tie main runners to hanger wires. Locate main runners within 6 inches of parallel walls to provide support for cross furring. Splice main runners by lapping l2 inches and wire tying each end of splice with two double strands of l6 gage wire.

E. Furring: Provide standard metal furring or metal screw stud type furring channels of sizes and spacings indicated in Table 2. Attach furring to main runners by saddle tying to main runners with two strands of No. l6 gage wire, or by suitable wire clips. Splice screw stud type furring channels by lapping 8 inches and secure with pan head sheet metal screws.

F. Do not abut runners or furring into masonry or concrete construction; allow 1 inch clearance, minimum between such construction and ends of runners or furring.

G. Install suspension system to required plane within + 1/8 inch in 12 feet.

H. Maximum Allowable Ceiling Deflection: 1/240.

I. Grillage Reinforcing: At light fixtures, access doors, and other ceiling openings that interrupt furring, provide additional furring reinforcing to restore grillage strength. Provide furring members at perimeters of ceiling openings.

J. Access Doors: Install access doors furnished under other trades. Provide hanger wire supports at corners of access doors sized l6 inches or larger.

3.04 INSTALLATION OF GYPSUM BOARD

A. General: Cut and fit gypsum board by scoring and breaking, or by sawing, working from face side. Smooth cut edges and ends of gypsum board to achieve neat joining. Where gypsum board meets projecting surfaces, scribe and cut. Remove cracked, broken or otherwise damaged boards and replace with new materials.

B. Walls Partitions and Columns: Apply gypsum board with long dimension parallel to metal stud framing members or metal furring channels. Except for column edges, lay out gypsum board ends and edges to occur over studs or channels, horizontally and vertically. Use gypsum board of maximum practical length to minimize joints. Joints to be neatly fitted and staggered on opposite sides of studs. Cut gypsum board to fit tight to penetrations and abutting items. Allow l/4 inch clear space at floor to prevent wicking. Reduce wicking gap to 1/8 inch at sound rated partitions. Extend gypsum board upward to structural slabs. Cover exposed gypsum board end joints at masonry walls with metal trim strip against a continuous bead of calking.

C. Ceilings: Apply gypsum board to the ceiling with long dimension at right angles to the furring members. Gypsum board may be applied with long dimension parallel to furring members that are spaced l6 inches o.c. when attachment members are provided at end joints.

D. Fire Rated Construction: Where fire rated construction is indicated, it shall be in accord with approved manufacturer's U.L. or F.M. fire rated installation directions.

E. Accessories and Trim: Install accessories and trim as follows:
   1. Corner Beads: Install specified corner beads from floor to ceiling line on all external gypsum board surfaces.
   2. Casing Beads: Install specified casing beads in all other locations where gypsum board abuts another material and to exposed gypsum board edges.
   3. Fasten above accessories and trim with staples or crimps in accord with manufacturer's recommendations. Cut end joints square and align for tight neat fit.
   4. Flanges of corner beads and control joints shall be coated with not less than two coats of taping compound sanded smooth.

3.05 GYPSUM BOARD ATTACHMENT

A. Space fasteners not less than 3/8 inch not more than l/2 inch from edges and ends of

gypsum board. While fasteners are being driven, hold the gypsum board in firm contact with underlying support. Proceed from the central portion of the gypsum board to the ends and edges. If the paper surfaces are broken by fastener in attachment, drive another fastener approximately 2 inches from the faulty fastener.

B. Drive screws with a mechanical tool, using a special bit to provide screwhead penetration just below gypsum board surface, without breaking surface paper or stripping the framing member around the screw.

C. Spacing of Fasteners - Screw Method:

1. Walls: Space screws l6 inches o.c., maximum.
2. Ceilings: Space screws l2 inches o.c., maximum.
3. Fire rated construction: Space screws l2 inches o.c., maximum in field and 8 inches o.c. at edges, unless otherwise indicated closer in manufacturer's UL fire rated design.
4. Fasten corner beads and trim with fasteners spaced 6 inches o.c., driven through gypsum board into framing members.

3.06 SHAFTWALL ASSEMBLY (Where Indicated)

A. Install shaft wall studs, tracks, shaft liner, wallboard, accessories, and finish wallboard joints in accordance with ASTM C754 for metal framing and ASTM C840 for joint treatment and manufacturer’s recommendations.

3.07 JOINT AND FASTENER TREATMENT

A. Mix and use joint finishing materials in accord with manufacturer's published directions. Allow a minimum drying time of 24 hours between coats. Sand as necessary after each application without scuffing paper surface of gypsum board.

B. Reinforce wall and ceiling angles and inside vertical corner angles with tape folded to conform to the adjoining surfaces and to form a straight, true angle.

C. Embedment Coat: Apply a thin, uniform layer of joint compound (embedding type) approximately 3 inches wide over the joint to be reinforced. Center tape over the joint and seat into the compound, leaving sufficient compound under the tape to provide proper bond. Apply a skim coat of compound immediately after embedding tape.

D. Fill Coat: After drying, apply fill coat over embedding coat by evenly spreading compound over and slightly beyond the tapered edge area of the gypsum board; feather at the edges.

E. Topping: Cover fill coat with topping compound, spread evenly over and slightly beyond the edge of the proceeding coat; feather to a smooth, uniform finish.

F. Fastener Concealment: Treat fastener dimples and holes as described for joint treatment.

G. Conceal flanges of corners beads, casing beads, trim members and control joints by a minimum of two coats of compound applied in accord with manufacturer's published directions.

H. Joints at Penetrations: Where pipes, conduits, ducts, electrical devices, and other items penetrate gypsum board, calk as described in Section 07920.

END OF SECTION

SECTION 09900

PAINTING

PART 1. GENERAL

1.01 SECTION INCLUDES

A. Field painting of new or modified exterior and interior building surfaces not excluded by specifications.

B. Field painting of existing exterior and interior building surfaces not excluded by specifications.

1.02 RELATED SECTIONS

A. 013300 - Submittal Procedures
B. 05520 - Handrails and Railings
C. 08100 - Metal Doors and Frames
D. 08210 - Wood Doors
E. 09200 - Gypsum Drywall Systems
F. 09210 - Gypsum Plaster
H. Division 15 - Coating of piping, hangers and equipment in concealed spaces.
I. Division 15 - Mechanical system item identification.
J. Division 16 - Electrical system item identification.

1.03 SUBMITTALS

A. Thirty days before starting this work, submit to Architect for color selection and review, manufacturer's color chips of full range of colors available for each type of paint specified. Colors selected by Architect may be colors selected to match another manufacturer's colors or colors selected to match a custom color sample.

B. After product data review and color selection, submit samples of each type and color of paint selected, applied to sample of applicable surfaces.

C. Selected color and sheen samples shall serve as quality standard for painting work throughout project for each color and paint type.

1.04 MAINTENANCE PAINT

A. Provide (2) two one-gallon containers of each type and color of paint clearly identified as to type, color and location, for Owner's maintenance use.

PART 2. PRODUCTS

2.01 PAINT MANUFACTURERS AND PRODUCTS LIST

A. Use only products manufactured by same manufacturer for primer or first coat and finish coats.

B. Manufacturer's name abbreviations used in specifications:
   1. Devoe: Devoe & Raynolds Co.
   2. Glidden: Glidden Coating and Resins Co.
   3. MAB: M.A. Bruder & Sons, Inc.
   4. PPG: PPG Industries, Inc. (Pittsburgh Paints)
   5. SW: The Sherwin Williams Co.
   6. Benjamin Moore

2.02 FLAT EXTERIOR LATEX

A. Devoe: Regency 12XX.
B. Glidden: Spred Glide-On House Paint 3600X.
C. MAB: Fresh Kote Latex Flat House Paint 409 Line.
D. PPG: Exterior Latex Flat House Paint 72 Series.
E. SW: Latex House and Trim Paint A6 Series.
F. Benjamin Moore #171. Moorecraft Super Spec. Flat Latex Housepaint

2.03 ALKYD EXTERIOR METAL PRIMER

A. Devoe: Mirrolac 1301.
B. Glidden: Glid-Guard Alkyd Metal Primer 4570.
C. MAB: Rust-O-Lastic Anti-Corrosive Primer 073-132.
D. PPG: Speedhide Inhibitive Red Primer 6-208 or White 6-712.
E. SW: Kromik Metal Primer E41N1.
F. Benjamin Moore: #M06, Alkyd Metal Primer

2.04 ALKYD PRIMER FOR GALVANIZED METAL

A. Devoe: Mirrocac 13201 Galvanized Primer.
B. Glidden: Glid-Guard Galvanized Metal Primer 5229.
C. MAB: Rust-O-Lastic Zinc Dust Primer 073-218.
D. PPG: Speedhide Galvanized Metal Primer 6-209.
E. SW: Galvite B50W3.
F. Benjamin Moore: #C163, Ironclad Alkyd Low Luster Metal and Wood Enamel

2.05 ZINC-CHROMATE PRIMER FOR ALUMINUM

A. Devoe: Bar-Ox Zinc Chromate primer No. 41839.
B. Glidden: Glid-Guard Zinc Chromate Metal Primer No. 5533.
C. MAB: Rust-0-Lastic Zinc Chromate Primer, Code 073-679.
D. PPG: Speedhide Zinc Chromate Primer 6-204.
E. SW: Zinc Chromate Primer B50Y1.

F. Benjamin Moore: #CM18/CM19, I.M.C. Epoxy Zinc Rich Primer

2.06 VINYL WASH PRIMER

A. Devoe: Galvanized Metal Primer 13201.
B. Glidden: Glid-Guard Vinyl Chloride Metal Conditioning Primer 5240.
C. MAB: Rust-O-Lastic Vinyl Wash Primer Code 760-093 Line.
D. PPG: Polyclutch Wash Primer 97-687/688/731.
E. SW: Wash Primer Green P60G2.

2.07 ALKYD EXTERIOR WOOD PRIMER

A. Devoe: All Weather Alkyd Primer 1102.
B. Glidden: Spred Gel Flow Prime Coat 3651.
C. MAB: Seashore Exterior Primer Coat.
D. PPG: Speedhide Exterior Wood Primer 1-870.
E. SW: A100 Alkyd Exterior Wood Primer Y24W20.
F. Benjamin Moore: #176, Moorecraft Super Spec. Alkyd Ext. Primer

2.08 GLOSS ALKYD EXTERIOR METAL ENAMEL

A. Devoe: Mirrolac Enamel 70XX.
B. Glidden: Glid-Guard Alkyd Industrial Enamel 4550.
C. MAB: Rust-O-Lastic Finish 074 Line.
D. PPG: Speedhide Exterior Interior Alkyd Gloss Enamel 6-252 Series.
E. SW: Industrial Enamel B-54.
F. Benjamin Moore: #M22, I.M.C. Urethane Alkyd Gloss Enamel

2.09 FLAT ALKYD EXTERIOR ENAMEL

A. Devoe: Mirrolac Alkyd Flat.
B. MAB: Fresh Kote House Paint 404 Line.
C. SW: Promar Alkyd Flat House Paint.

2.10 PVA INTERIOR PRIMER SEALER

A. Devoe: Wonder-Tones Vinyl Latex Primer Sealer 50801.
B. Glidden: Ultra-Hide PVA Primer-Sealer 5019.
C. MAB: Fresh Kote Vinyl Primer, Code 037-100.
D. PPG: Speedhide Quick Drying Latex Primer-Sealer 6-2.
E. SW: Promar 200 Latex Wall Primer B28W200.
F. Benjamin Moore: #253, Moorecraft Super Spec. Latex Enamel Undercoater and Primer Sealer

2.11 FLAT INTERIOR LATEX

A. Devoe: Wonder Tones 36XX.
B. Glidden: Spread Satin 3425.
C. MAB: Fresh Kote Latex Flat 402 Line.
D. PPG: Speedhide Flat Interior Wall Paint 6-70.
E. SW: Pro-Mar 200 Flat Wall Paint B30W200 Series.
F. Benjamin Moore: #275, Moorecrtaft Super Spec. Latex Flat
G. Zolatone

2.12 EGGSHELL/SATIN INTERIOR LATEX ENAMEL

A. Devoe: Wonder-Tones Interior Latex Eggshell Enamel.
B. Glidden: Ultra Hide Latex Satin Enamel.
C. MAB: Rich Lux Wall-Shield.
D. PPG: Speedhide Eggshell Latex Enamel.
E. SW: ProMar 200 Latex Egg Shell Enamel.
F. Benjamin Moore: #274, Moorecraft Super Spec. Latex Eggshell Enamel

2.13 SEMI-GLOSS INTERIOR LATEX ENAMEL

A. Devoe: Wonder Tones Interior Acrylic Latex Semi-Gloss Enamel.
B. Glidden: Spread Enamel - Latex Semi-Gloss.
C. MAB: Fresh Kote Latex Semi-Gloss Enamel.
D. PPG: Speedhide Latex Semi-Gloss Enamel.
E. SW: ProMar 200 Latex Semi-Gloss Enamel.
F. Benjamin Moore: #276, Moorecraft Super Spec. Latex Semi-Gloss Enamel

2.14 ALKYD INTERIOR METAL PRIMER

A. Devoe: Mirrolac Rust Penetrating Metal Primer 13101.
B. Glidden: Glid-Guard Metal Primer 4570 or Rust Master White 590.
C. MAB: Rust-O-Lastic Anti-Corrosive Metal Primer 073-132.
D. PPG: Speedhide Red Rust Inhibitive Primer 6-208 or White 6-712.
E. SW: Kromik Metal Primer E41N1.
F. Benjamin Moore: #C245, Super Alkyd Enamel Undercoater and Primes Sealer

2.15 ENAMEL UNDERCOATER

A. Devoe: Velour Alkyd Enamel Undercoat 8801.
B. Glidden: Spred Wood Undercoater 555.
C. MAB: Fresh Kote Enamel Undercoater 037-181.
D. PPG: Speedhide Quick Drying Enamel Undercoater 6-6.
E. SW: ProMar Alkyd Enamel Undercoater B49W2.
F. Benjamin Moore:#C245, Moorecraft Super Spec.Alkyd Enamel Undercoater and Primer Sealer

2.16 EGGSHELL ALKYD INTERIOR ENAMEL

A. Devoe: Velour Alkyd Eggshell Enamel 23XX.
B. Glidden: Ultra-Hide Eggshell Alkyd 5450.
C. MAB: Rich Lux Low Lustre Enamel Alkyd 021 Line.
D. PPG: Speedhide Alkyd Low Sheen Enamel 6-90.
E. SW: Pro-Mar 200 Alkyd Egg-Shell Enamel B33 Series.
F. Benjamin Moore: #C271, Super Spec. Alkyd Semi-Gloss Enamel

2.17 SEMI-GLOSS ALKYD INTERIOR ENAMEL

A. Devoe: Velour Semi-Gloss Alkyd Enamel 26XX.
B. Glidden: Spred Lustre Semi-Gloss 4600.
C. MAB: Fresh Kote Alkyd Semi-Gloss 403 Line.
D. PPG: Wallhide Semi-Gloss Alkyd Enamel 27 Line.
E. SW: Pro-Mar Alkyd Semi-Gloss Enamel B34W200.
F. Benjamin Moore: #C271, Super Spec. Alkyd Semi-Gloss Enamel

PART 3 EXECUTION

3.0l PREPARATION OF SURFACES

A. Clean surface of all dirt, dust, or other contaminants, which adversely affects adhesion of paint or appearance of finish. Moisture content of masonry, concrete, plaster and drywall surfaces shall not exceed l5 percent measured using a moisture meter. Thoroughly wash surfaces containing excess alkalinity as recommended by paint manufacturer. Where existing painted surfaces delaminate from the drywall or plaster wall surface, Contractor shall peel off all of the existing finish down to the raw gypsum plaster for the entire length of the wall and retexture the entire wall with USG Multi Purpose Texture Finish (orange peel) or equal, then paint as specified for new surfaces.

B. Stucco, Plaster, Concrete and Masonry:

1. Remove fins, projections, protruding nails or other metal fastenings and loose or foreign materials.
2. Remove form oil from concrete by washing with “Xylol”.
3. Patch large openings and holes with Portland cement mortar and after priming, fill remaining small depressions with a vinyl emulsion compound to match texture of surface as approved by the Paint Manufacturer.
4. Overhead precast concrete slabs with damaged or missing areas of textured coating: Remove loose material back to soundly adhered material. Feather edges of sound textured coating down to concrete surface by power sanding or by power wire brushing. Clean bare concrete free of contaminates by power sanding or by power wire brushing so that new textured coating will bond properly.

C. At Existing Painted Exterior Surfaces:

1. High pressure water blast or wire brush and water clean exterior before application of paint.
2. Contractor shall notify Owner before start of pressure cleaning operations with sufficient notice time to allow windows and doors to be closed and movable items in yards, to be removed for protection.
3. Protect existing electrical panel boxes, open conduit ends, HVAC or ventilation openings from high pressure, water spray damage by plastic sheeting taped and tied in place as required. After pressure cleaning operation, remove plastic sheeting covers and tape. Verify that windows and doors are closed and secure prior to start of cleaning operations.
4. Pressure cleaning operations or wire brush and water cleaning operation shall remove loose paint, scale, dirt, mold and other stains from building surfaces.

D. Gypsum Board:

1. New Work: Fill minor irregularities with spackling compound and sand to a smooth level surface exercising care to avoid raising nap of paper. Do not paint until compound has fully cured.
2. Existing Painted Surfaces: Remove grease, oil and other contaminants by washing with “Solax” dissolved in warm water, rinse thoroughly and dry. Remove loose and peeling paint and sand edges of sound paint flush.

E. At Existing Interior Surfaces:

1. Remove loose paint and peelings and use “ProSoco 859” paint stripper at all existing interior surfaces and fill minor irregularities with spackling compound prior to new paint application.

F. Woodwork:

1. New Work: Sand surfaces to achieve smooth finish. Prime wood to be painted and after drying, patch surface imperfections, cracks, holes, nail holes, and joints with putty, tinted to match transparent finish. Touch up knots and areas of high pitch content with shellac. Prepare surfaces to receive paint and transparent finishes before applying first coat. Do not sand faces of doors with medium density overlay finish.
2. Existing Painted Surfaces: Sand glossy surfaces to receive new enamel to remove gloss. Correct imperfections as specified above for new work. Wash surfaces with mineral spirits to remove grease and dirt.

G. Metal: Wash metal surfaces with mineral spirits to remove grease, oil and dirt. Wire brush or sand surfaces to remove rust and scale. Touch up factory primed surfaces with compatible primer.

3.02 APPLICATION AND WORKMANSHIP

A. Perform work using experienced, skilled painters in accordance with manufacturer's published directions. Mix and thin paint only as prescribed by the paint manufacturer.

B. Apply paint using brush, rollers or airless spray equipment. Application methods used shall provide complete coverage, uniform colors, specified thickness, desired sheen and accepted texture. Cut in edges by brush next to trim, abutting items and internal corners. Repaint any surfaces where differences occur in coverage, or where surfaces contain runs, sags, holidays, brush marks, air bubbles or stipple.

C. For each coat of paint use slightly different shade than preceding coat to distinguish various coats.

D. Sand wood surfaces between each coat, dust and apply succeeding coats.

E. Apply succeeding coats only after paint is thoroughly dry in accord with manufacturer's published directions.

F. Finish paint tops, bottoms and side edges of hollow metal doors same as faces of doors.

G. Back prime interior woodwork and cabinetwork before installation with material specified for prime coat.

H. Before painting, remove or provide ample protection of hardware, accessories, plates, lighting fixtures and similar items. Replace items when painting is completed.

I. At completion of work, touch up and restore field painted finish where damaged before occupancy.

3.03 SURFACES NOT TO BE PAINTED

A. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

B. Pre-finished items not to be painted include the following factory finished items with a decorative finish of color acceptable to Architect:
   1. Acoustic materials.
   2. Architectural woodwork and casework.
   3. Finished mechanical and electrical equipment.
   4. Light fixtures.
   5. Switchgear.
   6. Distribution cabinets.

C. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

   1. Furred areas and spaces above suspended ceilings.

2. Pipe spaces.
3. Interior of vertical shafts.

D. Wall surfaces from a line ½ inch below top of resilient base to finish floor line. E.

Finished metal surfaces not to be painted include:

1. Factory applied baked enamel surfaces.
2. Anodized aluminum.
3. Stainless steel.
4. Chromium plate.
5. Copper.
6. Bronze.
7. Brass.

F. Operating parts not to be painted include moving parts of operating equipment including the following:

1. Valve stems, valve and damper operators.
2. Linkages.
3. Sensing devices.
4. Motor and fan shafts.

G. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code required labels or equipment name, identification, performance rating, or nomenclature plates.

H. Underside of poured concrete slabs exposed and not identified in the Finish Schedule.

3.04 PAINTING SCHEDULE

A. Provide paint finishes, locations and type of coatings in accord with the Finish Schedule, Paint Manufacturers and Products List and following schedule. Carefully examine requirements of specification sections for this project for location, extent and nature of painting work required, including items not specifically included in schedules.

B. Existing Painted Surfaces: Omit following specified first coats provided that existing paint is unbroken, otherwise touch up or prime paint entire surface.

C. Exterior Surfaces:

1. Stucco / Concrete:
   3 Coats - Flat Exterior Latex.
2. Stucco / Cement Plaster / Concrete / Masonry / Galvanized Metal: Anti-Graffiti Coating Systelm.

1 Coat complete coverage - Ty-Cote Clear or Pigmented, Acrylic Base latex.
1 Coat complete coverage - Tex-Cote Clear Graffiti Guard III.

3. Ferrous Metal (Including piping, equipment and equipment supports on roofs): Touch-Up Shop Primed Surface.
   1 Coat - Alkyd Exterior metal Primer.
   2 coats - Gloss Alkyd Exterior Enamel.
4. Galvanized Metal (Including flashings, ducts, piping, equipment and equipment supports on roofs):
   1 Coat - Alkyd Primer for Galvanized Metal.
   2 Coats - Gloss Alkyd Exterior Metal Enamel.
5. Aluminum:
   1 Coat - Zinc Chromate Primer.
   2 Coats - Gloss Alkyd Exterior Metal Enamel.
6. Wood Surfaces:
   1 Coat Alkyd Primer.
   2 Coats - Flat or Gloss Alkyd Exterior Enamel. As selected by Architect.

D. Interior Surfaces:

1. Gypsum Wallboard in toilet Rooms and other wet areas:
   1 Coat - PVA Primer Sealer.
   1 Coat - Alkyd Enamel Undercoater, or Devoe Mirrolac-WB Gloss Acrylic Enamel tinted to match finish coat.
   2 Coats - Semi-Gloss Alkyd Enamel, or Devoe Mirrolac-WB Gloss Acrylic Enamel.
2. All Other Gypsum Wallboard, Cement Plaster and Gypsum Plaster Walls:
   1 Coat - PVA Primer Sealer.
   2 Coats - Eggshell or Semi-Gloss Interior Latex Enamel.
3. All Other Gypsum Wallboard, Cement Plaster and Gypsum Plaster Ceilings:
   l Coat - PVA Primer Sealer.
   2 Coats - Flat Interior Latex.
4. Block and Concrete:
   1 Coat - Block Filler (Concrete block only)
   2 Coats - Eggshell or Semi-Gloss Latex
5. Ferrous Metal:
   Touch-Up Shop Primed Surface. l Coat - Alkyd Metal Primer.
   2 Coats - Eggshell Alkyd Enamel.
6. Galvanized Metal: Use same type primer as specified for exterior galvanized metal areas.
   1 Coat - Alkyd Primer for Galvanized Metal.
   2 Coats - Eggshell Alkyd Enamel.
7. Wood and Wood Trim (Paint Finish):
   1 Coat - Alkyd Enamel Undercoater.
   2 Coats - Eggshell Alkyd Enamel.

8. Exposed Ferrous Piping, Valves and Hangers:
   l Coat - Alkyd Interior Primer.
   2 Coats - Eggshell Alkyd Enamel.
9. Exposed Pipe Insulation:
   l Coat - Quick Drying Emulsion Sealer.
   2 Coats - Eggshell Alkyd Enamel.
10. Exposed Galvanized Ductwork, Piping and Conduits:
    l Coat - Alkyd Primer for Galvanized Metal.
    2 Coats - Eggshell Alkyd Enamel.
11. Duct work visible through grilles or diffusers:
    1 Coat - Alkyd Primer for Galvanized Metal.
    1 Coat - Black Flat Alkyd Enamel.
12. Exposed Aluminum Ductwork and Conduit:
    1 Coat - Zinc Chromate Primer.
    2 Coats - Eggshell Alkyd Enamel.
13. Exposed Copper Tubing, Valves and Fittings:
    l Coat - Vinyl Wash Primer for Copper.
    2 Coats - Eggshell Alkyd Enamel.

E. Identification of Mechanical and Electrical Items:

1. Provide color code painting of exposed piping and conduits in equipment rooms of colors for various items as specified in Mechanical and Electrical Sections.

2. Pipe contents and piping contents flow direction arrow labels and valve tags; electrical equipment and conductor labels are specified in Mechanical and Electrical Sections.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Laboratory Test Reports for Credit EQ 4: For ceiling systems, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Wet-formed mineral fiber.

C. Acoustical Panel Standard: Comply with NRC 55.

D. Metal Suspension System Standard: Comply with ASTM C 635.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANELS <Insert drawing designation>

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:

1. Armstrong World Industries, Inc., fine fissured.

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

Armstrong World Industries, Inc., ‘Prelude’ 15/16” exposed T. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

END OF SECTION 095113

SECTION 230130
DUCT CLEANING

Contents

2.07 Pre-existing System Damage
2.08 Post-project Report
2.09 Applicable Standards and Publications

NADCA General Specifications

Part 1 -- Special Provisions

1.01 Qualification of the HVAC System Cleaning Contractor

(A) Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.

(B) Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.

(C) Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

(D) Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the **owner**. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

(E) Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.

1. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors should comply with applicable national safety codes and standards.

2. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply

with all other site documentation requirements of applicable OSHA programs and this specification

3. Contractor shall submit to the **owner** all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.

(F) Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

1.02 Standards

(A) NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).

1. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.

2. NADCA Standards must be followed with no modifications or deviations being allowed.

1.03 Documents

(A) Mechanical Drawings: The **owner** shall provide the HVAC system cleaning contractor with one copy of the following documents:

1. Project drawings and specifications.

2. Approved construction revisions pertaining to the HVAC system.

3. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

Part 2 -- HVAC System Cleaning Specifications and Requirements

2.01 Scope of Work

(A) Scope: This section defines the ***minimum*** requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.

The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.

The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

Note: Users of this specification must modify the above paragraph to succinctly and specifically define those systems and components requiring cleaning.

2.02 HVAC System Component Inspections and Site Preparations

(A) HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air handling units, a representative sample of the units should be inspected.

The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, environmental engineering control measures should be implemented

1. Damaged system components found during the inspection shall be documented and brought to the attention of the **owner**.

(B) Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

(C) Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection to determine the need for cleaning. At minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

2.03 General HVAC System Cleaning Requirements

(A) Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.

(B) Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.

(C) Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.

(D) Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

(E) Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

(F) Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.

1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.

2. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.

3. Closures must not significantly hinder, restrict, or alter the airflow within the system.

4. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
5. Openings must not compromise the structural integrity of the system.

6. Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
7. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.

8. Rigid fiber glass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.

9. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the **owner** in project report documents.

(G) Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.

(H) Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.

(I) Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. Contractor shall:

1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.

2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.

3. Clean all coils and related components, including evaporator fins.

(J) Duct Systems. Contractor shall:

1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

2.04 Health and Safety

(A) Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor's employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.

(B) Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.

(C) Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

2.05 Mechanical Cleaning Methodology

(A) Source Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protec-

tion of the indoor environment are assured.

2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.

3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

(B) Methods of Cleaning Fibrous Glass Insulated Components

1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

(C) Damaged Fibrous Glass Material

1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3. Replacement material: In the event fiber glass materials must be

replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

Replacement of damaged insulation is **not** covered by this specification.

(D) Cleaning of coils

1. Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

(E) Antimicrobial Agents and Coatings

1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.

3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer’s written recommendations and EPA registration listing.

4. Antimicrobial coatings shall be applied according to the manufacturer’s written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than “fogged” downstream onto surfaces.

2.06 Cleanliness Verification

(A) General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

(B) Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.

1. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the **owner** reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.

2. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

3. NADCA vacuum test analysis should be performed by a qualified third party experienced in testing of this nature.

(C) Verification of Coil Cleaning

1. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see NADCA Standards).

2.07 Pre-existing System Damage

(A) Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

2.08 Post-project Report

(A) At the conclusion of the project, the Contractor shall provide a report to the **owner** indicating the following:

1. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.

2. Areas of the system found to be damaged and/or in need of repair.

2.09 Applicable Standards and Publications: The following current standards and publications of the issues currently in effect form a part of this specification to the extent indicated by any reference thereto:

(A) National Air Duct Cleaners Association (NADCA): “Assessment, Cleaning & Restoration of HVAC Systems (ACR 2005),” 2004.

(B) National Air Duct Cleaners Association (NADCA): “Understanding Microbial Contamination in HVAC Systems,” 1996.

(C) National Air Duct Cleaners Association (NADCA): “Introduction to HVAC System Cleaning Services,” 2004.
(D) National Air Duct Cleaners Association (NADCA): Standard 05 “Requirements for the Installation of Service Openings in HVAC Systems,” 2004.

(E) Underwriters’ Laboratories (UL): UL Standard 181.

(F) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62-89, "Ventilation for Acceptable Indoor Air Quality".

(G) Environmental Protection Agency (EPA): "Building Air Quality," December 1991.

(H) Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): “HVAC Duct Construction Standards - Metal and Flexible,” 1985.

(I) North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," 1993.

END OF SECTION

SECTION 230500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. HVAC demolition.
8. Equipment installation requirements common to equipment sections.
9. Concrete bases.
10. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: **EPDM**, **NBR** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: **Plastic, Stainless steel**. Include two for each sealing element.

D. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: **Polished chrome-plated and rough brass**.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: **Polished chrome-plated and rough bras**].

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate

friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 4**000-psi (27.6-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "**Cast-in-Place Concrete, Miscellaneous Cast-in-Place Concrete**."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 230500

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Re-greasable bearing, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: **Class F**.

I. Code Letter Designation:

1. Motors **15** HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than **15** HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes **324T** and larger; rolled steel for motor frame sizes smaller than **324T**.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: [Ratings, characteristics, and features coordinated with and approved by controller manufacturer.]

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor

insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following, or available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**:

B. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: **EPDM-rubber, NBR** interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: **Plastic, Stainless steel**.
3. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide **1-inch (25-mm)** annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **2 inches (50 mm)** above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Comply with requirements for fire stopping specified in Division 07 Section "Penetration Fire stopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or whole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller than **NPS 6 (DN 150) Cast-iron wall sleeves, Galvanized-steel wall sleeves**.
   b. Piping **NPS 6 (DN 150)** and Larger: **Cast-iron wall sleeves, Galvanized-steel wall sleeves, PVC schedule 80 wall sleeves with sleeve-seal system.**

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than **NPS 6 (DN 150) Cast-iron wall sleeves with sleeve-seal system**, **Galvanized-steel wall sleeves with sleeve-seal system, PVC schedule 80 wall sleeves with sleeve-seal system**

      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping **NPS 6 (DN 150)** and Larger: **Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, PVC schedule 80 wall sleeves with sleeve-seal system.**

      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller than **NPS 6 (DN 150)**: **Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, and PVC schedule 80 wall sleeves with sleeve-seal system.** .

      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping **NPS 6 (DN 150)** and Larger: **Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, PVC schedule 80 wall sleeves with sleeve-seal system.**

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1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller than **NPS 6 (DN 150)**: **Galvanized-steel-pipe sleeves PVC-pipe sleeves**.
   b. Piping **NPS 6 (DN 150)** and Larger: **Galvanized-steel-pipe sleeves PVC-pipe sleeves**.

5. Interior Partitions:

   a. Piping Smaller than **NPS 6 (DN 150)**: **Galvanized-steel-pipe sleeves, PVC-pipe sleeves**.
   b. Piping **NPS 6 (DN 150)** and Larger: **Galvanized-steel-sheet sleeves, PVC** pipe sleeves.

END OF SECTION 230517

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. High-performance butterfly valves.
5. Bronze swing check valves.
6. Iron swing check valves.
7. Iron swing check valves with closure control.
8. Bronze gate valves.
9. Iron gate valves.
10. Bronze globe valves.
11. Iron globe valves.
12. Chainwheels.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (DN 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller **except plug valves**.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements,[**provide products by one of the following, but are not limited to, the following** :

a. Kitz Corporation.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig (2760 kPa).
c. Body Design: One piece.
d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following, but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. DynaQuip Controls.
d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.

e. Hammond Valve.
f. Jamesbury; a subsidiary of Metso Automation.
g. Jomar International, LTD.
h. Kitz Corporation.
i. Legend Valve.
j. Marwin Valve; a division of Richards Industries.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Red-White Valve Corporation.
n. RuB Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

C. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Kitz Corporation.
g. Marwin Valve; a division of Richards Industries.
h. Milwaukee Valve Company.
i. RuB Inc.
.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

D. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. Hammond Valve.
   b. Jamesbury; a subsidiary of Metso Automation.
   c. Legend Valve.
   d. Marwin Valve; a division of Richards Industries.
   e. Milwaukee Valve Company.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Regular.

E. Two-Piece, Regular-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

2.

   a. Jamesbury; a subsidiary of Metso Automation.
   b. Marwin Valve; a division of Richards Industries.

3. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Brass or bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Stainless steel.
   i. Ball: Stainless steel, vented.
   j. Port: Regular.

2.3 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

    a. American Valve, Inc.
    b. Conbraco Industries, Inc.; Apollo Valves.
    c. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 400 psig (2760 kPa).
    c. Body Design: One piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE or TFE.
    g. Stem: Bronze.
    h. Ball: Chrome-plated brass.
    i. Port: Reduced.

B. One-Piece, Reduced-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

    a. Conbraco Industries, Inc.; Apollo Valves.
    b. NIBCO INC.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig (4140 kPa).
    c. Body Design: One piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE or TFE.
    g. Stem: Stainless steel.
    h. Ball: Stainless steel, vented.
    i. Port: Reduced.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

    a. American Valve, Inc.
    b. Conbraco Industries, Inc.; Apollo Valves.
    c. Crane Co.; Crane Valve Group; Crane Valves.
    d. Hammond Valve.
    e. Lance Valves; a division of Advanced Thermal Systems, Inc.
    f. Legend Valve.
    g. Milwaukee Valve Company.
    h. NIBCO INC.

i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

D. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Lance Valves; a division of Advanced Thermal Systems, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

E. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.

e. DynaQuip Controls.
f. Hammond Valve.
g. Lance Valves; a division of Advanced Thermal Systems, Inc.
h. Milwaukee Valve Company.
i. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Regular.

F. Two-Piece, Regular-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Regular.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.

d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Norriseal; a Dover Corporation company.
m. Red-White Valve Corporation.
n. Spence Strainers International; a division of CIRCOR International.
o. Tyco Valves & Controls; a unit of Tyco Flow Control.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Norriseal; a Dover Corporation company.
m. Red-White Valve Corporation.
n. Spence Strainers International; a division of CIRCOR International.
o. Tyco Valves & Controls; a unit of Tyco Flow Control.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

C. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Spence Strainers International; a division of CIRCOR International.
o. Sure Flow Equipment Inc.
p. Tyco Valves & Controls; a unit of Tyco Flow Control.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated[**or -coated**] ductile iron.

D. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.

g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Spence Strainers International; a division of CIRCOR International.
o. Sure Flow Equipment Inc.
p. Tyco Valves & Controls; a unit of Tyco Flow Control.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated[**or -coated**] ductile iron.

E. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Sure Flow Equipment Inc.
q. Tyco Valves & Controls; a unit of Tyco Flow Control.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

F. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Sure Flow Equipment Inc.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

G. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.

g. Flo Fab Inc.
h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

H. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Flo Fab Inc.
h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.

f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

I. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.
j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Spence Strainers International; a division of CIRCOR International.
q. Sure Flow Equipment Inc.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated[**or -coated**] ductile iron.

J. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.

j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Spence Strainers International; a division of CIRCOR International.
q. Sure Flow Equipment Inc.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated **or -coated** ductile iron.

K. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.
j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Red-White Valve Corporation.
q. Spence Strainers International; a division of CIRCOR International.
r. Sure Flow Equipment Inc.
s. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

L. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.
j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Red-White Valve Corporation.
q. Spence Strainers International; a division of CIRCOR International.
r. Sure Flow Equipment Inc.
s. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

2.5 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Flowseal.

e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Hammond Valve.
h. Jamesbury; a subsidiary of Metso Automation.
i. Milwaukee Valve Company.
j. NIBCO INC.
k. Process Development & Control, Inc.
l. Tyco Valves & Controls; a unit of Tyco Flow Control.
m. Xomox Corporation.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig (1965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Flowseal.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Hammond Valve.
h. Jamesbury; a subsidiary of Metso Automation.
i. Milwaukee Valve Company.
j. NIBCO INC.
k. Process Development & Control, Inc.
l. Tyco Valves & Controls; a unit of Tyco Flow Control.
m. Xomox Corporation.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 720 psig (4965 kPa) at 100 deg F (38 deg C).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, or ductile iron.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   l. Zy-Tech Global Industries, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   j. <

2. Description:

   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.

f. Disc: PTFE or TFE.

C. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corporation.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.7 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.
    d. Hammond Valve.
    e. Kitz Corporation.
    f. Legend Valve.
    g. Milwaukee Valve Company.
    h. NIBCO INC.
    i. Powell Valves.
    j. Red-White Valve Corporation.
    k. Sure Flow Equipment Inc.
    l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    m. Zy-Tech Global Industries, Inc.

2. Description:

    a. Standard: MSS SP-71, Type I.
    b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

    c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

    d. Body Design: Clear or full waterway.
    e. Body Material: ASTM A 126, gray iron with bolted bonnet.
    f. Ends: Flanged.
    g. Trim: Bronze.
    h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.

    c. Standard: MSS SP-71, Type I.
    d. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

    e. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

    f. Body Design: Clear or full waterway.
    g. Body Material: ASTM A 126, gray iron with bolted bonnet.
    h. Ends: Flanged.
    i. Trim: Composition.
    j. Seat Ring: Bronze.
    k. Disc Holder: Bronze.
    l. Disc: PTFE or TFE.
    m. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-71, Type I.
   b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).

   c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).

   d. Body Design: Clear or full waterway.
   e. Body Material: ASTM A 126, gray iron with bolted bonnet.
   f. Ends: Flanged.
   g. Trim: Bronze.
   h. Gasket: Asbestos free.

2.8 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. NIBCO INC.

2. Description:

   a. Standard: MSS SP-71, Type I.
   b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

   c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

   d. Body Design: Clear or full waterway.
   e. Body Material: ASTM A 126, gray iron with bolted bonnet.
   f. Ends: Flanged.
   g. Trim: Bronze.
   h. Gasket: Asbestos free.
   i. Closure Control: Factory-installed, exterior lever and spring.

B. Class 125, Iron Swing Check Valves with Lever and Weight-Closure Control:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.
i. Closure Control: Factory-installed, exterior lever and weight.

2.9 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded **or solder joint** .
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron**, bronze, or aluminum.**.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   k. Zy-Tech Global Industries, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded **or solder joint** .
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron**, bronze, or aluminum**.

C. Class 150, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

   a. Hammond Valve.
   b. Kitz Corporation.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Powell Valves.
   f. Red-White Valve Corporation.
   g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 300 psig (2070 kPa).
   c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron**, bronze, or aluminum**.

D. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron[**, bronze, or aluminum**].

2.10 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following**

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig (1035 kPa).

d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

C. Class 250, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following**

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-70, Type I.

b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).

d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

D. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 500 psig (3450 kPa).

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 300 psig (2070 kPa).

d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

2.11 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

j. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded **or solder joint**.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Hand wheel: Malleable iron**, bronze, or aluminum**.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO INC.
d. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded **or solder joint**.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Hand wheel: Malleable iron**, bronze, or aluminum**.

C. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig (2070 kPa).

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Hand wheel: Malleable iron**, bronze, or aluminum**.

2.12 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 500 psig (3450 kPa).

c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.13 CHAINWHEELS

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following , but are not limited to, the following** :

2. Babbitt Steam Specialty Co.
3. Roto Hammer Industries.
4. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve, **Include zinc coating.**
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chain wheels on operators for **butterfly**, **gate, and globe** valves **NPS 4 (DN 100)** and larger and more than **96 inches (2400 mm)** above floor. Extend chains to **60 inches (1520 mm)** above finished floor.

F. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butter fly[**, or gate** valves.
2. Throttling Service, Except Steam: **Globe or ball or butterfly** valves.
3. Throttling Service, Steam: **Globe or butterfly** valves.
4. Pump-Discharge Check Valves:

    a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with **bronze or nonmetallic** disc.

    b. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze **and Brass** Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: **Class 125, Class 150, bronz,**,**nonmetallic** disc.
3. Ball Valves: **One, Two** piece, **full regular reduced** port, **brass or bronze** with **brass, bronze, or stainless-steel** trim.
4. Bronze Swing Check Valves: **Class 125, Class 150**, **bronze, nonmetallic** disc.

5. Bronze Gate Valves: **Class 125, Class 150**, **NRS, RS**, bronze.
6. Bronze Globe Valves: **Class 125,**[**Class 150**, **bronze,**[**nonmetallic** disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): 200 CWP, **EPDM, NBR** seat,[**aluminum-bronze, ductile-iron, stainless-steel** disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24 (DN 350 to DN 600): 150 CWP, **EPDM, NBR** seat, **aluminum-bronze, ductile-iron, stainless-steel** disc.
4. High-Performance Butterfly Valves: **Class 150, Class 300**, single flange.
5. Iron Swing Check Valves: **Class 125, Class 250**, **metal, nonmetallic-to-metal** seats.
6. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and **spring, weight**.
7. Iron Gate Valves: **Class 125, Class 250**, **NRS, OS&Y**.
8. Iron Globe Valves: **Class 125, Class 250**.

3.6 CONDENSER-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze **and Brass** Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: **One or**[**Two** piece, **full or**[**regular** port,[**brass or bronze** with **brass** or **bronze ,or stainless-steel** trim.
3. Bronze Swing Check Valves: **Class 125, Class 150**, **bronze nonmetallic** disc.
4. Bronze Gate Valves: **Class 125, Class 150**, **NRS, RS**.
5. Bronze Globe Valves: **Class 125, Class 150**, **bronze, nonmetallic** disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): 200 CWP, **EPDM, NBR** seat, **aluminum-bronze, ductile-iron, stainless-steel** disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24 (DN 350 to DN 600): 150 CWP, **EPDM, NBR** seat, **aluminum-bronze, ductile-iron, stainless-steel** disc.
4. High-Performance Butterfly Valves: **Class 300**, single flange.
5. Iron Swing Check Valves: **Class 250**, **metal, nonmetallic-to-metal** seats.
6. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and **spring**.
7. Iron Gate Valves: **Class 125, Class 250**,[**NRS, OS&Y**.
8. Iron Globe Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): [**Class 125, Class 250**.

3.7 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze **and Brass** Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: **One or**[**Two** piece, **full, regular** port, **brass or bronze** with **brass, bronze, or stainless-steel** trim.
3. Bronze Swing Check Valves: **Class 150**, **bronze** disc.
4. Bronze Gate Valves: **Class 150**,[**NRS.**.
5. Bronze Globe Valves: **Class 150**, **bronze** disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): 200 CWP, **EPDM** seat,[**aluminum-bronze, stainless-steel** disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24 (DN 350 to DN 600): 150 CWP, **EPDM** seat, **aluminum-bronze or stainless-steel** disc.
4. High-Performance Butterfly Valves: **Class 300**, single flange.
5. Iron Swing Check Valves: **Class 250**,**metal** seats.
6. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and **spring**.
7. Iron Gate Valves: **Class 250NRS**.
8. Iron Globe Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **Class 250**.

3.8 LOW-PRESSURE STEAM VALVE SCHEDULE (15 PSIG (104 kPa) OR LESS)

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball Valves: **One, or Two** piece, **full, regular** port, **brass or bronze** with **brass bronze or stainless-steel** trim.
2. Bronze Swing Check Valves: **Class 125 or Class 150**, **bronze** disc.
3. Bronze Gate Valves: **Class 125**, **Class 150**, **NRS.**
4. Bronze Globe Valves: **Class 125, or Class 150**, **bronze** disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. High-Performance Butterfly Valves: **Class 300**, single flange.
3. Iron Swing Check Valves: **Class 250**,[**metal** seats.
4. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and **spring.**.
5. Iron Gate Valves: **Class 250**, **NRS.**
6. Iron Globe Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **Class 250**.

3.9 HIGH-PRESSURE STEAM VALVE SCHEDULE (MORE THAN 15 PSIG (104 kPa))

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball Valves: **One, Two**] piece,[**full, regular** port, **brass or bronze** with **brass, bronze or stainless-steel** trim.
2. Bronze Swing Check Valves: **Class 150**,[**bronze** disc.
3. Bronze Gate Valves: **Class 150**, **NRS**, bronze.
4. Globe Valves: Class **150**, bronze,[**bronze** disc.

B. Pipe Sizes NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. High-Performance Butterfly Valves: **Class 300**, single flange.
3. Iron Swing Check Valves: **Class 250**, **metal** seats.
4. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): Class 125, lever and **spring**.
5. Iron Gate Valves: **Class 250**, **NRS.**
6. Iron Globe Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **Class 250.**

3.10 STEAM-CONDENSATE VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball Valves: **Oneor Two** piece, **full, regular** port, **brass or bronze**]with **brass,or bronze, or stainless-steel** trim.
2. Bronze Swing Check Valves: **Class 125,or Class 150**, **bronze** disc.
3. Bronze Gate Valves: **Class 125, or Class 150**, **NRS.**.
4. Bronze Globe Valves: [**Class 125, or Class 150**, **bronze** disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. High-Performance Butterfly Valves: **Class 300**, single flange.
3. Iron Swing Check Valves: **Class 250**, **metal** seats.
4. Iron Swing Check Valves with Closure Control: Class 125, lever and **spring.**
5. Iron Gate Valves: **Class 250**, **NRS.**
6. Iron Globe Valves, NPS 2-1/2 to NPS 12 (DN 65 to DN 300): **Class 250**.

END OF SECTION 230523

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to **ASCE/SEI 7**.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment **and obtain approval from authorities having jurisdiction**.

1.3 SUBMITTALS

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

B. Shop Drawings: **Signed and sealed by a qualified professional engineer.** Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of **carbon steel, stainless steel**.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of **stainless steel.**

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of **copper-coated steel, stainless steel.**

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: **ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa)** minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: **Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa),** or **ASTM C 552, Type II cellular glass with 100-psig (688-kPa), or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa)** minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type,[**zinc-coated, or stain less** steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, **NPS 2-1/2 (DN 65)** and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for **trapeze pipe hangers and equipment supports.**

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to **1-1/2 inches (40 mm)**.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 **painting Sections.**

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel **pipe hangers and supports and metal trapeze pipe hangers** and attachments for general service applications.

F. Use stainless-steel pipe hangers and **stainless-steel or corrosion-resistant** attachments for hostile environment applications.

G. Use copper-plated pipe hangers and **copper or stainless-steel** attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use **mechanical-expansion anchors** instead of building attachments where required in concrete construction.

“END OF SECTION 230529 “

SECTION 230548
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. **Freestanding and restrained** spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restraining braces and cables.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 185 mph.
2. Building Classification Category: **IV**.
3. Minimum 70 lb/sq. ft. (341.6 kg/sq. m) multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **A**.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: .

    a. Component Importance Factor: 1.15.
    b. Component Response Modification Factor: **2.5**.
    c. Component Amplification Factor: **1.25**.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second).
4. Design Spectral Response Acceleration at 1-Second Period:

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide **the product indicated on Drawings** or a comparable product by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

D. Pads per detail drawing arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant **neoprene, rubber.**

E. Mounts: per detail drawing double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Restrained Mounts : All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

G. Spring Isolators per drawing: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

H. Restrained Spring Isolators per drawing: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

I. Housed Spring Mounts per drawing: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch (6-mm) travel up or down before contacting a resilient collar.

J. Elastomeric Hangers per drawing: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

K. Spring Hangers per drawing: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

L. Spring Hangers with Vertical-Limit Stop per drawing: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

M. Pipe Riser Resilient Support per drawing: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.

N. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Where

clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide **the product indicated on Drawings** or a comparable product by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.
10.

D. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by **an evaluation service member of CC-ES, or OSHPD.**

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least **four** times the maximum seismic forces to which they will be subjected.

E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

F. Restraint Cables: **ASTM A 603 galvanized, or ASTM A 492 stainless**-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

G. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

H. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by **an evaluation service member of CC-ES, OSHPD**.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by **an evaluation service member of CC-ES, OSHPD,** providing required submittals for component.

C. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of **40 feet (12 m)** o.c., and longitudinal supports a maximum of **80 feet (24 m)** o.c.
3. Brace a change of direction longer than 12 feet (3.7 m).

D. Install cables so they do not bend across edges of adjacent equipment or building structure.

E. Install seismic-restraint devices using methods approved by **an evaluation service member of CC-ES, OSHPD,** providing required submittals for component.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 23 Section "Hydronic Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least **four** of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 HVAC VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

A. Supported or Suspended Equipment: per drawing.

1. Equipment Location: pre drawing.
2. Pads:

    a. Material: **Neoprene, Rubber**.
    b. Thickness: 3/4 **inches (19 mm)**>.
    c. Number of Pads:one ¾ inch thick.

3. Isolator Type: per drawing detail.
4. Base Type: per drawing detail .
5. Minimum Deflection: 3/8 **inches (8 mm).**
6. Component Importance Factor: 1.15.
7. Component Response Modification Factor: [**1.5**
8. Component Amplification Factor: **2.5**.

END OF SECTION 230548

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

1.2 SUBMITTAL

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

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: [**Brass, 0.032-inch (0.8-mm)**] [**Stainless steel, 0.025-inch (0.64-mm)**] minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel **self-tapping screws.**.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/8 inch (3.2 mm)** thick, and having predrilled holes for attachment hardware.
2. Letter Color: **White**
3. Background Color: **Black**
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel **self-tapping screws**.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving,**1/8 inch (3.2 mm)** thick, and having predrilled holes for attachment hardware.

B. Letter Color: **Yellow.**

C. Background Color: **Black**.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed **cover full** circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/8 inch (3.2 mm)** thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: **Black**

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section **High-Performance Coating.**."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 3**0 feet (10 m)** along each run. Reduce intervals to **20 feet (6.1 m)** in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping:

   a. Background Color: **Light Green.**
   b. Letter Color: **Black**.

2. Condenser-Water Piping:

   a. Background Color**: Light Blue**
   b. Letter Color: **Black.**.

3. Heating Water Piping:

   a. Background Color: **White**
   b. Letter Color: **Red**

4. Refrigerant Piping:

   a. Background Color: **Yellow**.
   b. Letter Color: **Black**.

5. Low-Pressure Steam Piping:

   a. Background Color: **Red**

   b. Letter Color: **White**

   c. High-Pressure Steam Piping:

   d. Background Color: **Red**
   e. Letter Color: **Yellow**.

6. Steam Condensate Piping:

   a. Background Color: **Blue**] .
   b. Letter Color: **Yellow**.

3.4 DUCT LABEL INSTALLATION

A. Install **plastic-laminated and self-adhesive** duct labels with permanent adhesive on air ducts in the following color codes:

1. **Blue:** For cold-air supply ducts.
2. **Yellow:** For hot-air supply ducts.
3. **Green** : For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of **50 feet (15 m)** in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

   a. Constant-volume air systems.
   b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.

1.2 DEFINITIONS

A. NEBB: National Environmental Balancing Bureau.

B. TAB: Testing, adjusting, and balancing.

C. TABB: Testing, Adjusting, and Balancing Bureau.

D. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

A. LEED Submittal:

1. Air-Balance Report for LEED Prerequisite EQ 1: Documentation of work performed for ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Strategies and Procedures Plan: Within 45 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

C. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by **NEBB.**

1. TAB Field Supervisor: Employee of the TAB contractor and certified by **NEBB**.
2. TAB Technician: Employee of the TAB contractor and who is certified by **NEBB** as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by **Owner** or **Commissioning Authority.**

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "**Metal Ducts, Nonmetal Ducts"** and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in **NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"** and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in **inch-pound (IP),or metric (SI)** units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from **Owner**, or C**ommissioning Authority** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

    a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from **Owner, or Commissioning Authority** and comply with requirements in Division 23 Section "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

    a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated presettings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.11 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator[**and condenser**] to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller

installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.12 PROCEDURES FOR COOLING TOWERS

A. Shut off makeup water for the duration of the test, and verify that makeup and blowdown systems are fully operational after tests and before leaving the equipment. Perform the following tests and record the results:

1. Measure condenser-water flow to each cell of the cooling tower.
2. Measure entering- and leaving-water temperatures.
3. Measure wet- and dry-bulb temperatures of entering air.
4. Measure wet- and dry-bulb temperatures of leaving air.
5. Measure condenser-water flow rate recirculating through the cooling tower.
6. Measure cooling-tower spray pump discharge pressure.
7. Adjust water level and feed rate of makeup water system.
8. Measure flow through bypass.

3.13 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.14 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

B. Steam Boilers: Measure and record entering-water temperature and flow and leaving-steam pressure, temperature, and flow.

3.15 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.16 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.

2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.17 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: **Plus or minus 10 percent**.
2. Air Outlets and Inlets: **Plus or minus 10 percent**.
3. Heating-Water Flow Rate: **Plus or minus 10 percent**.
4. Cooling-Water Flow Rate: **Plus or minus 10 percent.**

3.18 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare **biweekly, or monthly** progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.19 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.

7. Position of balancing devices.

3.20 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713
DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Related Sections:

1. Division 23 Section "HVAC Equipment Insulation."
2. Division 23 Section "HVAC Piping Insulation."
3. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
2. Laboratory Test Reports for Credit EQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.

4. Detail application at linkages of control devices.

D. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, **Type II with factory-applied vinyl jacket, or Type III with factory-applied FSP jacket**. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, **provide one of the following,**

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation **with factory-applied ASJ, or with factory-applied FSK jacket**. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, **provide one of the following** :

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

H. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a **2**-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, **provide one of the following** :

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
d. Thermal Ceramics; FireMaster Duct Wrap.
e. 3M; Fire Barrier Wrap Products.
f. Unifrax Corporation; FyreWrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to themselves and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, **provide one of the following**:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic

Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, **provide one of the following**

2. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
   a. Eagle Bridges - Marathon Industries; 225.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
   c. Mon-Eco Industries, Inc.; 22-25.
   d. <**Insert manufacturer's name; product name or designation**>.

3. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, **provide one of the following** :

   a. Dow Corning Corporation; 739, Dow Silicone.
   b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
   c. P.I.C. Plastics, Inc.; Welding Adhesive.
   d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, **provide one of the following** :

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perms (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, **provide one of the following**:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, **provide one of the following**:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic

Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, **provide one of the following**:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for ducts.

1. Products: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
   b. Vimasco Corporation; Elastafab 894.

c. <**Insert manufacturer's name; product name or designation**>.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, **provide one of the following** :

   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: **White**, or **Color-code jackets based on system, or Color as selected by Architect** .

D. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, **provide one of the following**:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.

2. **Sheet and roll stock ready for shop or field sizing, or Factory cut and rolled to size**.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: **heat-bonded polyethylene and kraft paper 3-mil- (0.075-mm-) thick.**
5. Moisture Barrier for Outdoor Applications: **3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper**.

E. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with **white, or stucco-embossed** aluminum-foil facing.

1. Products: Subject to compliance with requirements, **provide one of the following:**

2. Polyguard Products, Inc.; Alumaguard 60.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, **provide one of the following:** ABI, Ideal Tape Division; 428 AWF ASJ.
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
   b. Compac Corporation; 104 and 105.
   c. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, **provide one of the following**:

   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, **provide one of the following**:

   a. ABI, Ideal Tape Division; 370 White PVC tape.
   b. Compac Corporation; 130.
   c. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, **provide one of the following** :

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, **3/4 inch (19 mm)** wide with **wing seal** , **or closed seal** .

1. Products: Subject to compliance with requirements, **provide one of the following** :

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, **provide one of the following** :

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: **Copper- or zinc-coated, low-carbon steel, or, Aluminum, Stainless steel**, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, **provide one of the following** :

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
c. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, and securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, **provide one of the following** :

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
c. Spindle: **Copper- or zinc-coated, low-carbon steel, Aluminum, Stainless steel**, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, **galvanized-steel, aluminum, stainless-steel** sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Products: Subject to compliance with requirements, **provide one of the following** :

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:

1) GEMCO.

2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: **0.080-inch (2.0-mm) nickel-copper alloy, or 0.062-inch (1.6-mm) soft-annealed, stainless steel**.

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following** :

a. C & F Wire.

2.10 CORNER ANGLES

A. PVC Corner Angles: **30 mils (0.8 mm)** thick, minimum 1 by 1 inch (25 by 25 mm), PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: **0.040 inch (1.0 mm)** thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **2 inches (50 mm)** o. c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor

insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for **80** percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for [**100**] [**50**] <**Insert number**> percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer ‘s recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.7 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: **Two** finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to **one** location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber **blanket 2 inches (50 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber **blanket**, **1-1/2 inches (38 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

C. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber **blanket**, **1-1/2 inches (38 mm)** thick and **0.75-lb/cu. ft. (12-kg/cu. m)**, or **1.5-lb/cu. ft. (24-kg/cu. m) nominal** density.

D. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber **blanket**, **1-1/2 inches (38 mm)** thick and **0.75-lb/cu. ft. (12-kg/cu. m)** nominal density.

E. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated **blanket**, **or board**; thickness as required to achieve 2-hour fire rating.

F. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber **board**, **1-1/2 inches (38 mm),** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

G. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber **board**, **1-1/2 inches (38 mm)** thick and [**0.75-lb/cu. ft. (12-kg/cu. m)** nominal density.

H. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber **board**, 1 inch (25mm) thick and **0.75-lb/cu. ft. (12-kg/cu. m)** nominal density.

I. Exposed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber **board** , **1 inches (25 mm) , or none,0.75-lb/cu. ft. (12-kg/cu. m)** nominal density.

J. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated **board**; thickness as required to achieve 2-hour fire rating.

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber **blanket**, **2 inches (50 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

C. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber **blanket**, **1-1/2 inches (38 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

D. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber **blanket 1 inch (25 mm)** thick, and **0.75-lb/cu. ft. (12-kg/cu. mm** nominal density.

E. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber **board**, **2 inches (50 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

F. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber **board**, **1-1/2 inches (38 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.
2. **PVC, Color-Coded by System**: **20 mils (0.5 mm)** thick.
3. Aluminum, **Smooth**: **0.024 inch (0.61 mm)** thick.

D. Ducts and Plenums, Exposed:

1. None.
2. **PVC, Color-Coded by System**: **20 mils (0.5 mm)** thick.
3. Aluminum, **Smooth**: **0.024 inch (0.61 mm)** thick.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B If more than one material is listed, selection from materials listed is Contractor's option.

C Ducts and Plenums, Concealed:

1. None.
2. **PVC, Color-Coded by System**: **30 mils (0.8 mm)** thick.
3. Aluminum, **Smooth, Stucco Embossed**: **0.020 inch (0.51 mm)** thick.

D Ducts and Plenums, Exposed, up to 48 Inches (1200 mm) in Diameter or with Flat Surfaces up to 72 Inches (1800 mm):

1 Aluminum, **Smooth, Stucco Embossed**: **0.024 inch (0.61 mm)** thick.

E Ducts and Plenums, Exposed, Larger Than 48 Inches (1200 mm) in Diameter or with Flat Surfaces Larger Than 72 Inches (1800 mm):

1 Painted Aluminum, Smooth, with i-1/4 inch (32 mm) Deep Corrugated 0.032 inch thick.

END OF SECTION 230713

SECTION 230719
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Chilled-water and brine piping, **indoors and outdoors**.
2. Heating hot-water piping, indoors, and outdoors.
3. Refrigerant suction and hot-gas piping, **indoors and outdoors**.
4. Dual-service heating and cooling piping, indoors and outdoors.

B. Related Sections:

1. Division 23 Section "HVAC Equipment Insulation."
2. Division 23 Section "Duct Insulation."
3. Division 23 Section "Underground Hydronic Piping" for loose-fill pipe insulation in underground piping outside the building.
4. Division 33 Section "Underground Steam and Condensate Distribution Piping" for loose-fill pipe insulation in underground piping outside the building.

1.2 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

    a. Pittsburgh Corning Corporation; Foamglas.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ. Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricated shapes according to ASTM C 450 and ASTM C 585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 1290, Type I.

1. Products: Subject to compliance with requirements, provide the following but are not limited to, the following.

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide the, but are not limited to, the following.

    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000-Degree Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ,with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F (649 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ,with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

2. Knauf Insulation; Permawick Pipe Insulation.
    a. Owens Corning; VaporWick Pipe Insulation.

J. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

    a. Armacell LLC; Tubolit.
    b. Nomaco Insulation; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide the, but are not limited to, the following.

    a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).

1. Products: Subject to compliance with requirements,[provide the, but are not limited to, the following.

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide the following,but are not limited to, the following.

    a. Aeroflex USA, Inc.; Aeroseal.
    b. Armacell LLC; Armaflex 520 Adhesive.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
    d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide the following [, but are not limited to, the following.

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide the following but are not limited to, the following.

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.
f. <

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

    b. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. (34 g/sq. m) with a thread count of 10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm), in a Leno weave, for pipe.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

2. Johns Manville; Zeston.
a. P.I.C. Plastics, Inc.; FG Series.
b. Proto Corporation; LoSmoke.
c. Speedline Corporation; SmokeSafe.

3. Adhesive: As recommended by jacket material manufacturer.
4. Color: White, or Color-code jackets based on system, or Color as selected by Architect.
5. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing, or Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft pape , 2.5-mil- (0.063-mm-) thick polysurlyn.
5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper, or [2.5-mil- (0.063-mm-) thick polysurlyn.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c. Tee covers.
d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white, or stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Polyguard Products, Inc.; Alumaguard 60.

F. PVDC Jacket for Indoor Applications: 4-mil- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric perms) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film.

G. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms (0.007 metric perms) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following[, but are not limited to, the following.

a. Dow Chemical Company (The); Saran 560 Vapor Retarder Film.

H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
e.

2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
b.

2. Width: 3 inches (75 mm).
3. Film Thickness: 4 mils (0.10 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following, but are not limited to, the following.

a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.

2. Width: 3 inches (75 mm).
3. Film Thickness: 6 mils (0.15 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, [1/2 inch (13 mm)] [3/4 inch (19 mm)] wide with wing seal, or closed seal.

1. Products: Subject to compliance with requirements, provide the, but are not limited to, the following.

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: [0.080-inch (2.0-mm) nickel-copper alloy, or 0.062-inch (1.6-mm) soft-annealed, stainless steel, as required in Drawings.

D. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain subparagraph and list of manufacturers below. See Division 01 Section "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, but are not limited to, the following.

a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches (50 mm) o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes.

Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate

overlap at butt joint of 2 inches (50 mm) over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.

3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch- (850-mm-) circumference limit allows for 2-inch- (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.10 FINISHES

A. Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water and Brine, above 40 Deg F (5 Deg C): Insulation shall be one of the following:

1. Cellular Glass: 1-1/2 inches (38 mm), 2 inches (50 mm) thick.
2. Flexible Elastomeric: 1 inch (25 mm) thick.
3. Mineral-Fiber,[Preformed Pipe, Type I, or Pipe Insulation Wicking System 1 inch (25 mm), 1-1/2 inches (38 mm), 2 inches (50 mm) per Drawing. thick.
4. Polyolefin: 1 inch (25 mm) thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below: Insulation shall be one of the following:

1. Cellular Glass: 1-1/2 inches (38 mm), or 2 inches (50 mm) per drawing. thick.
2. Mineral-Fiber, Preformed Pipe, Type I: 1 inch (25 mm), 2 inches (50 mm) per drawing thick.

C. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric, 1 inch (25 mm)] thick.

D. Refrigerant Suction and Hot-Gas Flexible Tubing: Flexible elastomeric, 1 inch (25 mm) thick.

E. Dual-Service Heating and Cooling, 40 to 200 Deg F (5 to 93 Deg C): Insulation shall be one of the following:

1. Cellular Glass: [1-1/2 inches (38 mm), or 2 inches (50 mm) thick.
2. Mineral-Fiber, Preformed Pipe, Type I: 1 inch (25 mm), or 1-1/2 inches (38 mm), or 2 inches (50 mm) per drawing thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water and Brine: Insulation shall be[one of] the following:

1. Cellular Glass: [3 inches (75 mm) thick.
2. Flexible Elastomeric: 3 inches (75 mm) thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches (75 mm) thick.
4. Polyolefin: 3 inches (75 mm) thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below: Insulation shall be one of the following:

1. Cellular Glass: 3 inches (75 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

C. Refrigerant Suction and Hot-Gas Piping: Insulation shall be one of the following:

1. Cellular Glass: 2 inches (50 mm) thick.
2. Flexible Elastomeric: 2 inches (50 mm) thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.
4. Polyolefin: 2 inches (50 mm) thick.

D. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be[one of] the following:

1. Flexible Elastomeric: 2 inches (50 mm) thick.
2. Polyolefin: 2 inches (50 mm) thick.

E. Dual-Service Heating and Cooling: Insulation shall be one of the following:

1. Cellular Glass: 3 inches (75 mm) thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Division 33 piping distribution Sections.

B. Chilled Water, All Sizes: Cellular glass,[2 inches (50 mm) thick.

C. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F (93 Deg C) and Below: Cellular glass, 3 inches (75 mm) thick.

D. Dual-Service Heating and Cooling, All Sizes, 40 to 200 Deg F (4 to 93 Deg C): Cellular glass, 3 inches (75 mm) thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.
2. PVC. PVC, Color-Coded by System: 20 mils (0.5 mm), or [30 mils (0.8 mm) thick.
3. Aluminum, Smooth, Corrugated, Stucco Embossed: 0.024 inch (0.61 mm) hick.

D. Piping, Exposed:

1. None.
2. PVC, or PVC, Color-Coded by System 30 mils (0.8 mm) thick.
3. Aluminum, Smooth ,Corrugated 0.020 inch (0.51 mm) thick.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.
2. PVC, or PVC, Color-Coded by System: 20 mils (0.5 mm), or 30 mils (0.8 mm) thick.
3. Aluminum, Smooth, Corrugated 0.020 inch (0.51 mm) thick.
4. <

D. Piping, Exposed:

1. PVC: 30 mils (0.8 mm) thick.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230719

SECTION 232113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Condenser-water piping.
4. Makeup-water piping.
5. Condensate-drain piping.
6. Blowdown-drain piping.
7. Air-vent piping.
8. Safety-valve-inlet and -outlet piping.

B. See Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.2 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: **150 psig** at 200 deg. F.
2. Chilled-Water Piping: 150 psig at 200 deg. F.
3. Condenser-Water Piping: 150 psig at150 deg. F.
4. Makeup-Water Piping: 80 psig at 150 deg. F.
5. Condensate-Drain Piping: 150 psig at 66 deg. F.
6. Blowdown-Drain Piping: at 200 deg. F.
7. Air-Vent Piping: at 200 deg. F.
8. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.3 SUBMITTALS

A. Product Data: For each type of the following:

1. Plastic pipe and fittings with solvent cement.
2. Pressure-seal fittings.
3. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
4. Air control devices.
5. Chemical treatment.
6. Hydronic specialties.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: Detail, at ¼ or 1/50 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

D. Field quality-control test reports.

E. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Fittings: ASME B16.22.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawing or a comparable product by one of the following:

a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Victaulic Company.

4. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
5. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasket fitting. Ductile-iron housing with keys matching pipe and fitting grooves, pre lubricated EPDM gasket rated for minimum 230 deg. F or 110 deg. C for use with housing, and steel bolts and nuts.

E. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Grooved Mechanical-Joint Fittings and Couplings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Anvil International, Inc.
b. Central Sprinkler Company; a division of Tyco Fire & Building Products.
c. National Fittings, Inc.
d. S. P. Fittings; a division of Star Pipe Products.
e. Victaulic Company.

4. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
5. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

2.3 PLASTIC PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.

B. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.

C. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.

D. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.

a. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

G. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. IPEX Inc.
c. KBi.

3. CPVC and PVC one-piece fitting with one threaded brass or copper insert and one Schedule 80 solvent-cement-joint end.

B. Plastic-to-Metal Transition Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. IPEX Inc.
c. KBi.
d. NIBCO INC.

3. MSS SP-107, CPVC and PVC union. Include brass or copper end, Schedule 80 solvent-cement-joint end, rubber gasket, and threaded union.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, but are not limited to, the following.

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International Ltd.
e. Matco-Norca, Inc.
f. McDonald, A. Y. Mfg. Co.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig (860 kPa), minimum at 180 deg. F (82 deg.C).
c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Armstrong Pumps, Inc.
b. Bell & Gossett Domestic Pump; a division of ITT Industries.
c. Flow Design Inc.
d. Gerand Engineering Co.
e. Griswold Controls.
f. Taco.
g. Tour & Andersson; available through Victaulic Company.

4. Body: Bronze, ball or plug type with calibrated orifice or venturi.
5. Ball: Brass or stainless steel.
6. Plug: Resin.
7. Seat: PTFE.
8. End Connections: Threaded or socket.
9. Pressure Gage Connections: Integral seals for portable differential pressure meter.
10. Handle Style: Lever, with memory stop to retain set position.
11. CWP Rating: Minimum 125 psig (860 k P.a).
12. Maximum Operating Temperature: 250 deg. F(121 deg C).

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Armstrong Pumps, Inc.
b. Bell & Gossett Domestic Pump; a division of ITT Industries.
c. Flow Design Inc.
d. Gerand Engineering Co.
e. Griswold Controls.

f. Taco.

4. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
5. Ball: Brass or stainless steel.
6. Stem Seals: EPDM O-rings.
7. Disc: Glass and carbon-filled PTFE.
8. Seat: PTFE.
9. End Connections: Flanged or grooved.
10. Pressure Gage Connections: Integral seals for portable differential pressure meter.
11. Handle Style: Lever, with memory stop to retain set position.
12. CWP Rating: Minimum 125 psig (860 k Pa.)
13. Maximum Operating Temperature: 250 deg. F (121 deg. C)

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Amtrol, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett Domestic Pump; a division of ITT Industries.
d. Conbraco Industries, Inc.
e. Spence Engineering Company, Inc.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

4. Body: Bronze or brass.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: Brass.
7. Stem Seals: EPDM O-rings.
8. Diaphragm: EPT.
9. Low inlet-pressure check valve.
10. Inlet Strainer: Stain less steel, removable without system shutdown.
11. Valve Seat and Stem: Noncorrosive.
12. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Amtrol, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett Domestic Pump; a division of ITT Industries.
d. Conbraco Industries, Inc.
e. Spence Engineering Company, Inc.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

4. Body: Bronze or brass.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: Brass.
7. Stem Seals: EPDM O-rings.
8. Diaphragm: EPT.
9. Wetted, Internal Work Parts: Brass and rubber.
10. Inlet Strainer: stain less steel, removable without system shutdown.
11. Valve Seat and Stem: Noncorrosive.
12. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Automatic Flow-Control Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

a. Flow Design Inc.
b. Griswold Controls.

4. Body: Brass or ferrous metal.
5. Piston and Spring Assembly: Stainless Steel, tamper proof, self cleaning, and removable.
6. Combination Assemblies: Include bonze or brass-alloy ball valve.
7. Identification Tag: Marked with zone identification, valve number, and flow rate.
8. Size: Same as pipe in which installed.
9. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.

10. Minimum CWP Rating: 175 psig (1207 k Pa).
11. Maximum Operating Temperature: 200 deg. F (93 deg. C).

2.8 AIR CONTROL DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

C. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS ½ (D N 15).
5. Discharge Connection: NPS 1/8 (D N 6).
6. CWP Rating: 150 psig (1035 k Pa).
7. Maximum Operating Temperature: 225 deg. F(107 deg C).

D. Expansion Tanks:

1. Tank: Welded steel, rated for 125 psig (860 k P. a) working pressure and 375 deg. F (191 deg. C) maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested with taps fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal (379–L) unit only; sized for compression-tank diameter. Provide tank fittings for 125 psig (860 k P. a) working pressure and 250 deg F (121 deg. C) maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125 psig (860 k P.a) working pressure and 240 deg. F(116 deg. C) maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, ¾-inch-(20 mm), 2 inch diameter gage glass, and slotted-metal glass guard.

E. In-Line Air Separators:

1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig (1207 k P a.).
3. Maximum Operating Temperature: Up to 300 deg. F(149 deg. C).

2.9 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125 psig (860 k P.a), working pressure;5-gal (19-L) capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Ethylene and Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.

2.10 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2 ½ (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 k P.a).

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

C. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 (DN 50) **and smaller,** shall be **any of** the following:

1. Type L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered, brazed, pressure-seal** joints.
2. Schedul **40** steel pipe; Class**150, malleable-iron, 300, malleable-iron** fittings; cast-iron flanges and flange fittings; and threaded joints.
3. Schedule **80** CPVC plastic pipe and fittings and solvent-welded joints.

B. Hot-water heating piping, aboveground, [NPS 2-1/2 (DN 65) **and larger,** shall be **any of** the following:

1. Type L(B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **brazed** joints.
2. Schedule **40** steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule **40** steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
4. Schedule **80** CPVC plastic pipe and fittings and solvent-welded joints.

C. Hot-Water Heating Piping Installed Belowground and within Slabs: Type K (A), annealed-temper copper tubing, wrought-copper fittings, and **brazed** joints. Use the fewest possible joints.

D. Chilled-water piping, aboveground, NPS 2 (DN 50) **and smaller,** shall be **any of** the following:

1. Type[L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered**] [**brazed, pressure-seal** joints.
2. Schedule [**40**] steel pipe; Class**150, malleable-iron, 300, malleable-iron** fittings; cast-iron flanges and flange fittings; and threaded joints.
3. Schedule **80** CPVC plastic pipe and fittings and solvent-welded joints.

E. Chilled-water piping, aboveground, NPS 2-1/2 (DN 65) **and larger,** shall be **any of** the following:

1. Type L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered, brazed** joints.
2. Schedule **40** steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

3. Schedule **40** steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
4. Schedule**80** CPVC plastic pipe and fittings and solvent-welded joints.

F. Chilled-Water Piping Installed Belowground and within Slabs: Type K (A), annealed-temper copper tubing, wrought-copper fittings, and **brazed** joints. Use the fewest possible joints.

G. Condenser-water piping, aboveground, NPS 2 (DN 50) **and smaller,** shall be **any of** the following:

1. Type L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered** , **pressure-seal** joints.
2. Schedule **40** steel pipe; Class **150, malleable-iron** fittings; cast-iron flanges and flange fittings; and threaded joints.
3. Schedule **40** CPVC plastic pipe and fittings and solvent-welded joints.

H. Condenser-water piping, aboveground, NPS 2-1/2 (DN 65) **and larger,** shall be **any of** the following:

1. Type L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered, brazed** joints.
2. Schedule**40** steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule**40** steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
4. Schedule**40, 80** CPVC plastic pipe and fittings and solvent-welded joints.

I. Condenser-Water Piping Installed Belowground and within Slabs: Type K (A), annealed-temper copper tubing, wrought-copper fittings, and **brazed** joints. Use the fewest possible joints.

J. Makeup-water piping installed aboveground shall be **either of** the following:

1. Type L (B), M (C), drawn-temper copper tubing, wrought-copper fittings, and **soldered** ,**brazed** joints.
2. Schedule[**40** CPVC plastic pipe and fittings, and solvent-welded joints.

K. Makeup-Water Piping Installed Belowground and within Slabs: Type K (A), annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

L. Condensate-Drain Piping: Type M (C), drawn-temper copper tubing, wrought-copper fittings, and soldered joints **or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints**.

M. Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

N. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

O. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K (A), annealed-temper copper tubing with soldered or flared joints.

P. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install **throttling-duty, calibrated-orifice, balancing** valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using **mechanically formed** tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

U. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).

6. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
7. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
6. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).

F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

G. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

J. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches (1200 mm) above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

E. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.

2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 CHEMICAL TREATMENT

A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

B. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

C. Fill systems indicated to have antifreeze or glycol solutions with the following concentrations:

1. Hot-Water Heating Piping: Minimum 10 percent **ethylene** glycol.
2. Chilled-Water Heating Piping: Minimum 10 percent **ethylene** glycol.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test

pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232123
HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Close-coupled, in-line centrifugal pumps.
2. Close-coupled, end-suction centrifugal pumps.
3. Separately coupled, horizontally mounted, in-line centrifugal pumps.
4. Separately coupled, vertically mounted, in-line centrifugal pumps.
5. Separately coupled, base-mounted, end-suction centrifugal pumps.
6. Automatic condensate pump units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pump.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.
2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products that may be incorporated into the Work include, but are not limited to, the following]:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Crane Pumps & Systems.
4. Flowserve Corporation.
5. Grundfos Pumps Corporation.
6. ITT Corporation; Bell & Gossett.
7. Mepco, LLC.

8. PACO Pumps.
9. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
10. Peerless Pump Company.
11. TACO Incorporated.
12. Thrush Company Inc.

C. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

D. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet**,** replaceable bronze wear rings,and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Permanently lubricated ball bearings.

E. Motor: Single speed and rigidly mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

    a. Enclosure: Totally enclosed, fan cooled Retain "Enclosure Materials," "Motor Bearings," "Unusual Service Conditions," "Efficiency," "NEMA Design," and "Service Factor" subparagraphs below if options are available from pump manufacturers and are different from default requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." Consider each subparagraph and retain only those that vary from default requirements.
    b. Enclosure Materials: Cast iron, Cast Aluminum.
    c. Permanently lubricated ball bearings are available up through 5 hp. Larger motors have grease-lubricated ball bearings.
    d. Motor Bearings: Permanently lubricated, or Grease-lubricated ball bearings.
    e. Unusual Service Conditions:

        1) Ambient Temperature: 95 deg. F.
        2) Altitude: 10 Feet above sea level.
        3) High humidity.
        4) Humidity up to 85%.

f. Efficiency: Premium efficient , 60 % and higher.

g. NEMA Design: NEMA 3R

h. Service Factor: Continuous run and minimum Service factor of 1.15.% of rated Current.

F. Capacities and Characteristics:

1. Capacity: per related Drawing.
2. Total Dynamic Head: per related Drawings.
3. Maximum Operating Pressure: 175 psig (1204 kPa).
4. Maximum Continuous Operating Temperature: 225 deg. F (107 deg C**)**.
5. Inlet and Outlet Size: per related Drawings.
6. Impeller Size: per related Drawing.
7. Motor Speed: per related Drawing
8. Motor Horsepower: per related Drawing
9. Electrical Characteristics:

a. Volts: 208, 460 v/ three phase.
b. Phase: Three.
c. Hertz: 60.hz
d. Full-Load Amperes: per related Drawing.
e. Minimum Circuit Ampacity: per related Drawing.
f. Maximum Overcurrent Protection: per related Drawing.

2.2 CLOSE-COUPLED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements.

B. Retain "Basis-of-Design Product" Paragraph and list of manufacturers below to identify a specific product or a comparable product from manufacturers listed. Retain option and delete insert note if manufacturer's name and model number are indicated on Drawings.

C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. American-Marsh Pumps.
2. Armstrong Pumps Inc.
3. Aurora Pump; Division of Pentair Pump Group.
4. Buffalo Pumps, Inc.
5. Crane Pumps & Systems.
6. Flowserve Corporation.
7. ITT Corporation; Bell & Gossett.
8. ITT Corporation; Goulds Pumps.
9. Lancaster Pump.
10. Mepco, LLC.
11. PACO Pumps.
12. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
13. Peerless Pump Company.
14. Scot Pump; Div. of Ardox Corp.
15. TACO Incorporated.
16. Thrush Company Inc.

D. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

E. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and threaded companion-flange, or flanged connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and [EPT bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings, or Oil lubricated; bronze-journal or thrust type.

F. Motor: Single speed and rigidly mounted to pump casing with integral pump support.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

    a. Enclosure: Totally enclosed, fan cooled.

    b. Retain "Enclosure Materials," "Motor Bearings," "Unusual Service Conditions," "Efficiency," "NEMA Design," and "Service Factor" subparagraphs below if options are available from pump manufacturers and are different from default requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." Consider each subparagraph and retain only those that vary from default requirements.
    c. Enclosure Materials: Cast iron, Cast aluminum. .
    d. Motor Bearings: Permanently lubricated, or Grease-lubricated ball bearings.
    e. Unusual Service Conditions:

        1) Ambient Temperature: 95 deg. .F.
        2) Altitude: 10 Feet above sea level.
        3) High humidity.
        4) 85% humidity.

    f. Efficiency: Premium efficient.
    g. NEMA Design: NEMA 3R.
    h. Service Factor: minimum 1.15 % of rated..

G. Capacities and Characteristics:

1. Capacity: per related Drawing.

2. Total Dynamic Head: per related Drawing.

3. Maximum Operating Pressure: 175 psig (1204 kPa).

4. Maximum Continuous Operating Temperature: 225 deg F (107 deg C).

5. Inlet and Outlet Size: per related Drawing.

6. Impeller Size: per related Drawing.

7 Motor Speed: per related Drawing.

8 Motor Horsepower: per related Drawing.

9 Electrical Characteristics:

a. Volts: 208v, or 460v..
b. Phase: Three.
c. Hertz: 60.Hz

7. Full-Load Amperes: per related Drawing.

a Minimum Circuit Ampacity: per related Drawing.

b Maximum Overcurrent Protection: per related Drawing.

2.3 SEPARATELY COUPLED, HORIZONTALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, Retain "Basis-of-Design Product" Paragraph and list of manufacturers below to identify a specific product or a comparable product from manufacturers listed. Retain option and delete insert note if manufacturer's name and model number are indicated on Drawings.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Flowserve Corporation.
4. Grundfos Pumps Corporation.
5. ITT Corporation; Bell & Gossett.
6. Mepco, LLC.
7. PACO Pumps.
8. Scot Pump; Div. of Ardox Corp.
9. TACO Incorporated.
10. Thrush Company Inc.

C. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally.

D. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, and keyed to shaft. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT]bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Permanently lubricated ball bearings, or Oil lubricated; bronze-journal or thrust type.

E. Shaft Coupling: Molded-rubber insert with interlocking spider, Interlocking frame with interconnecting springs capable of absorbing vibration.

F. Motor: Single speed and[resilientl mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

    a. Enclosure: Totally enclosed, fan cooled.
    b. Enclosure Materials: Cast iron, Cast aluminum.
    c. Motor Bearings: Permanently lubricated,or Grease-lubricated ball bearings.
    d. Unusual Service Conditions:

        1) Ambient Temperature: 95 deg. F..
        2) Altitude: 10 Feet above sea level.
        3) High humidity.
        4) 80 % humidity

    e. Efficiency: Premium efficient.
    f. NEMA Design: NEMA 3R.
    g. Service Factor: 1.15 % of rated current.

G. Capacities and Characteristics:

1. Capacity: per related Drawing.
2. Total Dynamic Head: per related Drawing..
3. Maximum Operating Pressure: 175 psig (1204 kPa).
4. Maximum Continuous Operating Temperature: 225 deg F (107 deg C).
5. Inlet and Outlet Size: per related Drawing..
6. Impeller Size: per related Drawing..
7. Motor Speed: per related Drawing..
8. Motor Horsepower: per related Drawing.
9. Electrical Characteristics:

    a. Volts: 208v,or 460v.
    b. Phase: Three.

c. Hertz: 60.Hz
d. Full-Load Amperes: per related Drawing.
e. Minimum Circuit Ampacity: per related Drawing.
f. Maximum Overcurrent Protection: per related Drawing..

2.4 SEPARATELY COUPLED, VERTICALLY MOUNTED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Aurora Pump; Division of Pentair Pump Group.
3. Crane Pumps & Systems.
4. Flowserve Corporation.
5. ITT Corporation; Bell & Gossett.
6. Mepco, LLC.
7. PACO Pumps.
8. Peerless Pump Company.
9. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
10. TACO Incorporated.
11. Thrush Company Inc.

C. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted vertically.

D. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and out let, replaceable bronze wear rings, and threaded companion-flangend connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve .
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and [Buna-N] [EPT] bellows and gasket. Include water slinger on shaft between motor and seal.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Permanently lubricated ball bearings. or Oil lubricated; bronze-journal or thrust type.

E. Shaft Coupling: Axially split spacer coupling.

F. Motor: Single speed and rigidly mounted to pump casing with lifting eyebolt and supporting lugs in motor enclosure.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   a. Full-Load Amperes: per related Drawing
   b. Minimum Circuit Ampacity: per related Drawing.
   c. Maximum Overcurrent Protection: per related Drawing.

2.5 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. American-Marsh Pumps. Enclosure: Totally enclosed, fan cooled.
   b. Enclosure Materials: Cast iron, Cast aluminum.
   c. Motor Bearings: Permanently lubricated, or Grease-lubricated ball bearings.
   d. Unusual Service Conditions:

      1) Ambient Temperature: 95 deg. F.
      2) Altitude: 10 Feet above sea level.
      3) High humidity.
      4) 85 % humidity

   e. Efficiency: Premium efficient., 65% and more
   f. NEMA Design: NEMA 3R
   g. Service Factor: 1.15% of rated current, continues run.

C. Capacities and Characteristics:

1. Capacity: per related Drawing.
2. Total Dynamic Head: per related Drawing.
3. Maximum Operating Pressure: 175 psig (1204 kPa).
4. Maximum Continuous Operating Temperature: 225 deg F (107 deg C).
5. Inlet and Outlet Size: per related Drawing.
6. Impeller Size: per related Drawing.
7. Motor Speed: per related Drawing
8. Motor Horsepower: per related Drawing.
9. Electrical Characteristics:

   a. Volts: 208v, 460v
   b. Phase: Three phase.
   c. Hertz: 60 Hz.

10.
11. Armstrong Pumps Inc.
12. Aurora Pump; Division of Pentair Pump Group.
13. Buffalo Pumps, Inc.

14. Crane Pumps & Systems.
15. Flowserve Corporation.
16. ITT Corporation; Bell & Gossett.
17. Mepco, LLC.
18. PACO Pumps.
19. Peerless Pump Company.
20. Scot Pump; Div. of Ardox Corp.
21. TACO Incorporated.
22. Thrush Company Inc.

D. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.

E. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and threaded companion-flange connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.]
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and [Buna-N] [EPT] bellows and gasket.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.

F. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.

G. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

H. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

I. Motor: Single speed, secured to mounting frame, with adjustable alignment.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

a. Enclosure: Totally enclosed, fan cooled

b. Retain "Enclosure Materials," "Motor Bearings," "Unusual Service Conditions," "Efficiency," "NEMA Design," and "Service Factor" subparagraphs below if options are available from pump manufacturers and are different from default requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." Consider each subparagraph and retain only those that vary from default requirements.

c. Enclosure Materials: Cast iron, Cast aluminum] Rolled steel..

d. Motor Bearings: Permanently lubricated, or Grease-lubricated ball bearings.

e. Unusual Service Conditions:

1) Ambient Temperature: 95 deg. F
2) Altitude: 10 Feet above sea level.
3) High humidity.
4) 85 % . >.

f. Efficiency: Premium efficient. 65% or higher

g. NEMA Design: NEMA 3 R.

h. Service Factor: 1.15 % of rated current, or continuous.

J. Capacities and Characteristics:

1. Capacity: per related Drawing.
2. Total Dynamic Head: per related Drawing.
3. Maximum Operating Pressure: 175 psig (1204 kPa).
4. Maximum Continuous Operating Temperature: 225 deg F (107 deg C).
5. Inlet and Outlet Size: per related Drawing.
6. Impeller Size: per related Drawing.
7. Motor Horsepower: per related Drawing.
8. Electrical Characteristics:

a. Volts 208v, 460v
b. Phase: Three phase.
c. Hertz: 60.Hz
d. Full-Load Amperes: per related Drawing.
e. Minimum Circuit Ampacity: per related Drawing.
f. Maximum Overcurrent Protection: per related Drawing..

2.6 AUTOMATIC CONDENSATE PUMP UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by the following, but are not limited to, the following.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:

1. Beckett Corporation.
2. Hartell Pumps Div.; Milton Roy Co.
3. Little Giant Pump Co.
4. Mepco, LLC.

C. Description: Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Include factory- or field-installed check valve and a 72-inch- (1800-mm-) minimum, electrical power cord with plug.

D. Capacities and Characteristics:

1. Capacity: per related Drawing.
2. Total Dynamic Head: per related Drawing.
3. Maximum Height to Inlet: per related Drawing.
4. Inlet and Outlet Size: per related Drawing.
5. Motor Speed: per related Drawing.
6. Motor Horsepower: per related Drawing.
7. Electrical Characteristics:

    a. Volts: 120v, 208v
    b. Phase: Single.
    c. Hertz: 60. hz
    d. Full-Load Amperes: per related Drawing.
    e. Minimum Circuit Ampacity: per related Drawing.
    f. Maximum Overcurrent Protection: per related Drawing.

2.7 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:

1. Angle pattern.
2. 175-psig (1204-kPa) pressure rating, ductile-iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Triple-Duty Valve:

1. Angle or straight pattern.
2. 175-psig (1204-kPa) pressure rating, ductile-iron body, pump-discharge fitting.
3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

E. Equipment Mounting: Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases specified in Division 03 Section " Cast-in-Place Concrete ."

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct bases to withstand, without damage to equipment, seismic force required by code.
3. Construct concrete bases 4 inches (100 mm), 6 inches (150 mm), or the hight indicated in Drawings, 6 inches (150 mm) in all directions beyond the maximum dimensions of base-mounted pumps unless otherwise indicated or unless required for seismic-anchor support.
4. Minimum Compressive Strength: 4500 psi (31 MPa), 4000 psi (27.6 MPa) at 28 days.

F. Equipment Mounting: Install base-mounted pumps on cast-in-place concrete equipment base(s) using elastomeric pads, elastomeric mounts, restrained spring isolators.. Comply with requirements for equipment bases specified in Division 03 Section " Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Minimum Deflection: 1/4 inch (6 mm),1/2 inch (12 mm)
2. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.
3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of concrete base.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Install anchor bolts to elevations required for proper attachment to supported equipment.
7. Install on 4-inch- (100-mm-) , 6-inch- (150-mm-) high concrete base designed to withstand, without damage to equipment, seismic force required by code.

G. Equipment Mounting: Install base-mounted pumps using elastomeric pads, elastomeric mounts, restrained spring isolators.. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Minimum Deflection: 1/4 inch (6 mm), 1/2 inch (12 mm).

H. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and elastomeric hangers, spring hangers, spring hangers with vertical-limit stop of size required to support weight of in-line pumps.

1. Comply with requirements for seismic-restraint devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
2. Comply with requirements for hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

3.2 ALIGNMENT

A. Engage a factory-authorized service representative to perform, alignment service.

B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturers' written instructions.

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Steam and Condensate Heating Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to pump, allow space for service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check, shutoff, and throttling valve with memory stop] on discharge side of pumps.

F. Install Y-type strainer, suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

I. Install check valve and gate or ball valve on each condensate pump unit discharge.

J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 232123

SECTION 236423
SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Packaged, air-cooled, electric-motor-driven, scroll water chillers.

1.2 PERFORMANCE REQUIREMENTS

A. Windstorm Performance: Chiller attachment shall be able to withstand the effect of wind seepds of 180 mph per ASCE 7-10.

1.3 SUBMITTALS

A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

B. Certificates: For certification required in "Quality Assurance" Article.

C. Wind storm Qualification Certificates: For water chillers, accessories, and components from manufacturers.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Startup service reports.

E. Operation and maintenance data.

F. Warranty.

1.4 QUALITY ASSURANCE

A. ARI Certification: Certify chiller according to ARI 590 certification program.

B. ARI Rating: Rate water chiller performance according to requirements in ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

C. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

F. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified period.

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

PART 2 - PRODUCTS

2.1 PACKAGED AIR-COOLED WATER CHILLERS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following.:

B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or approved equal.

C. Description: Factory-assembled and run-tested water chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.

D. Fabricate base, frame, and attachment to water chiller components strong enough to resist movement during a seismic event when water chiller base is anchored to field support structure.

E. Cabinet:

1. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.
3. Casing: Galvanized steel.
4. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500 hour salt-spray test according to ASTM B 117.
5. Sound-reduction package consisting of the following:

    a. Acoustic enclosure around compressors.
    b. Reduced-speed fans with acoustic treatment.
    c. Designed to reduce sound level without affecting performance.

6. Security Package: Provide security grilles with fasteners for additional protection of compressors, evaporator, and condenser coils. Grilles shall be coated for corrosion resistance and shall be removable for service access.

F. Compressors:

1. Description: Positive-displacement direct drive with hermetically sealed casing.
2. Each compressor provided with suction and discharge service valves, crankcase oil heater, and suction strainer.
3. Operating Speed: Nominal 3600 rpm for 60-Hz applications.
4. Capacity Control: On-off compressor cycling[**,** plus hot-gas bypass.
5. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug, and initial oil charge.
6. Vibration Isolation: Mount individual compressors on vibration isolators.

G. Compressor Motors:

1. Hermetically sealed and cooled by refrigerant suction gas.
2. High-torque, two-pole induction type with inherent thermal-overload protection on each phase.

H. Compressor Motor Controllers:

1. Across the Line: NEMA ICS 2, Class A, full voltage, nonreversing.

I. Refrigeration:

1. Refrigerant: **R-410a**. Classified as Safety Group A1 according to ASHRAE 34.
2. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
3. Refrigerant Circuit: Each circuit shall include a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
4. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.

J. Evaporator:

1. Brazed-plate or shell-and-tube design, as indicated.
2. Shell and Tube:

    a. Description: Direct-expansion, shell-and-tube design with fluid flowing through the shell and refrigerant flowing through the tubes within the shell.
    b. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
    c. Shell Material: Carbon steel.
    d. Shell Heads: Removable carbon-steel heads with multipass baffles designed to ensure positive oil return and located at each end of the tube bundle.
    e. Shell Nozzles: Fluid nozzles located along the side of the shell and terminated with mechanical-coupling end connections for connection to field piping.
    f. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.

3. Brazed Plate:

a. Direct-expansion, single-pass, brazed-plate design.
b. Type 316 stainless-steel construction.
c. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
d. Fluid Nozzles: Terminate with mechanical-coupling end connections for connection to field piping.

4. Heater: Factory-installed and -wired electric heater with integral controls designed to protect the evaporator to minus 20 deg F (minus 29 deg C).
5. Remote Mounting: Designed for remote field mounting where indicated. Provide kit for field installation.

K. Air-Cooled Condenser:

1. Plate-fin coil with integral subcooling on each circuit, rated at 450 psig (3103 kPa).

a. Construct coils of copper tubes mechanically bonded to aluminum with pre - coated epoxy-phenolic, or[copper fins.
b. Coat coils with a baked epoxy corrosion-resistant coating after fabrication.
c. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.

2. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge.
3. Fan Motors: Totally enclosed nonventilating (TENV) or totally enclosed air over (TEAO) enclosure, with permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.
4. Fan Guards: Steel safety guards with corrosion-resistant coating.

L. Electrical Power:

1. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller.
2. House in a unit-mounted, NEMA 250, Type 3R enclosure with hinged access door with lock and key or padlock and key.
3. Wiring shall be numbered and color-coded to match wiring diagram.
4. Install factory wiring outside of an enclosure in a raceway.
5. Field power interface shall be to heavy-duty, nonfused disconnect switch.
6. Provide branch power circuit to each motor and to controls with one of the following disconnecting means:

a. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
b. NEMA KS 1, heavy-duty, nonfusible switch.
c. NEMA AB 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

7. Provide each motor with overcurrent protection.
8. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
9. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.

10. Provide power factor correction capacitors to correct power factor to 0.95 at full load.
11. Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

    a. Power unit-mounted controls where indicated.
    b. Power unit-mounted, ground fault interrupt (GFI) duplex receptacle.

12. Control Relays: Auxiliary and adjustable time-delay relays.
13. Indicate the following for water chiller electrical power supply:

    a. Current, phase to phase, for all three phases.
    b. Voltage, phase to phase and phase to neutral for all three phases.
    c. Three-phase real power (kilowatts).
    d. Three-phase reactive power (kilovolt amperes reactive).
    e. Power factor.
    f. Running log of total power versus time (kilowatt hours).
    g. Fault log, with time and date of each.

M. Controls:

1. Stand-alone, microprocessor based.
2. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure of matching construction.
3. Operator Interface: Keypad or pressure-sensitive touch screen. Multiple-character, backlit, liquid-crystal display or light-emitting diodes. Display the following:

    a. Date and time.
    b. Operating or alarm status.
    c. Operating hours.
    d. Outside-air temperature if required for chilled-water reset.
    e. Temperature and pressure of operating set points.
    f. Entering and leaving temperatures of chilled water.
    g. Refrigerant pressures in evaporator and condenser.
    h. Saturation temperature in evaporator and condenser.
    i. No cooling load condition.
    j. Elapsed time meter (compressor run status).
    k. Pump status.
    l. Antirecycling timer status.
    m. Percent of maximum motor amperage.
    n. Current-limit set point.
    o. Number of compressor starts.
    .

4. Control Functions:

    a. Manual or automatic startup and shutdown time schedule.
    b. Entering and leaving chilled-water temperatures, control set points, and motor load limit. Chilled-water leaving temperature shall be reset based on return-water temperature.
    c. Current limit and demand limit.
    d. External water chiller emergency stop.
    e. Antirecycling timer.

f. Automatic lead-lag switching.
g. .

5. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:

a. Low evaporator pressure or high condenser pressure.
b. Low chilled-water temperature.
c. Refrigerant high pressure.
d. High or low oil pressure.
e. High oil temperature.
f. Loss of chilled-water flow.
g. Control device failure.
.

N. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I, for tubular materials and Type II, for sheet materials.
2. Thickness: 1-1/2 inches (38 mm)..
3. Factory-applied insulation over cold surfaces of water chiller components.

a. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.

4. Apply protective coating to exposed surfaces of insulation.

O. Accessories:

1. Factory-furnished, chilled and condenser water flow switches for field installation.
2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.
3. Factory-furnished neoprene or spring isolators for field installation.

P. Capacities and Characteristics:

1. Capacity: 60 **tons** .
2. Full-Load Efficiency:

a. COP: <**Insert number**>.
b. EER: not less than 10 EER..
c. Power Input/Cooling Output, kW/Ton not more than 1.2

3. Part-Load Efficiency:

a. IPLV: not less than 12.5 EER.
b. NPLV: <**Insert number**>.

4. Low Ambient Operation: Chiller designed for operation to 3**0 deg. F (-2 deg.C)**
5. High Ambient Operation: Chiller designed for operation to**115 deg. F (46 deg C).**
6. Evaporator Configuration: **Integral to chiller.**
7. Evaporator Pressure Rating: **150 psig (1034 kPa.).**
8. Evaporator Fluid Type : **Fresh Water.**

9. Design Evaporator Fluid Flow Rate: 128 **gpm (8.08L/s)**.
10. Minimum Evaporator Fluid Flow Rate:30 **gpm (2/s).**
11. Evaporator Entering-Fluid Temperature: 55 **deg. F (12 deg C).**
12. Evaporator Leaving-Fluid Temperature: 45 **deg F (7 deg C.**.
13. Evaporator Fluid Pressure Drop:10 **feet of head (3.35 kPa)**.
14. Evaporator Fouling Factor: **0.0001 sq. ft. x hr x deg. F/Btu (0.000018 sq. m x deg C/W)**..
15. Condenser Entering-Air Temperature: 91 **deg. F (33 deg C)**.
16. Site Altitude: 6 **feet (2 m)**.
17. Number of Refrigeration Circuits:Two.
18. Compressor Rated Load Amperes: 87 Amps..
19. Compressor Locked-Rotor Amperes: 650 Amps.
20. Controls Power Connection: Fed through integral transformer.

    a. Controls Power Input: 208v/120V/ three phase,or 120V/single phase...
    b. Controls Minimum Circuit Ampacity: 20 Amps..
    c. Controls Maximum Overcurrent Protection Device:20 Amps..
    d. Controls Electrical Characteristics: 208V/120V/3phase or 120V/single phase, 60 Hz.

21. Chiller Power Input: 68 kilowatts.
22. Chiller Minimum Circuit Ampacity: 135 Amps.
23. Chiller Maximum Overcurrent Protection Device:150 Amps.
24. Chiller Electrical Characteristics: 480V **a**c, three phase, 60 Hz.
25. Noise Rating: 98 **dBA** at 21 **feet (7m)** when measured according to ARI 370.

2.2 SOURCE QUALITY CONTROL

A. Perform functional test of water chillers before shipping.

B. Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.

C. For water chillers located outdoors, rate sound power level according to ARI 370 procedure.

PART 3 - EXECUTION

3.1 WATER CHILLER INSTALLATION

A. Install water chillers on support structure indicated.

B. Equipment Mounting: Install water chiller on concrete bases using elastomeric pads,or restrained spring isolators. Comply with requirements in Division 03 Section "Cast-in-Place Concrete." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Minimum Deflection: 1/2 inch (12 mm).

2. install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install water chiller using elastomeric pads,or restrained spring isolators. Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Minimum Deflection: 1/2 inch (12 mm).

D. Equipment Mounting: Install water chiller on vibration isolation inertia bases. Comply with requirements specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

E. Equipment Mounting: Install water chiller on concrete bases. Comply with requirements in Division 03 Section "Cast-in-Place Concrete"

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

F. Maintain manufacturer's recommended clearances for service and maintenance.

G. Charge water chiller with refrigerant if not factory charged and fill with oil if not factory installed.

H. Install separate devices furnished by manufacturer and not factory installed.

3.2 CONNECTIONS

A. Comply with requirements in Division 23 Section "Hydronic Piping" Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to chiller to allow service and maintenance.

C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve. Make connections to water chiller with a union, or, flang, or mechanical coupling union.

D. Connect each drain connection with a union and drain pipe and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection if required.

3.3 STARTUP SERVICE

A. [Engage a factory-authorized service representative to perform] [Perform] startup service.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

C. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
2. Verify that pumps are installed and functional.
3. Verify that thermometers and gages are installed.
4. Operate water chiller for run-in period.
5. Check bearing lubrication and oil levels.
6. Verify proper motor rotation.
7. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
8. Verify and record performance of chilled-water flow and low-temperature interlocks.
9. Verify and record performance of water chiller protection devices.
10. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

D. Prepare a written startup report that records results of tests and inspections.

END OF SECTION 236423

SECTION 237313
MODULAR INDOOR CENTRAL STATION AIR-HANDLING UNIT

Part 1 — General

1.01 SYSTEM DESCRIPTION

Indoor mounted central station air-handling unit designed to provide air to a conditioned space as required to meet specified performance requirements for ventilation, heating, cooling, filtration and distribution. Unit shall be assembled for draw-thru application and shall be arranged to discharge conditioned air horizontally or vertically as shown on the contract drawings.

Unit with a direct-expansion cooling coil shall have the capability to be used in a refrigerant circuit in conjunction with air-cooled condensing units.

1.02 QUALITY ASSURANCE

A. Unit performance shall be rated in accordance with AHRI Standard 430 for Central Station Air-Handling Units and subject to verification of rating accuracy by AHRI-sponsored, third party testing.

B. Coils shall be certified in accordance with AHRI Standard 410, latest edition.

A. Direct expansion coils shall be designed and tested in accordance with ANSI/ASHRAE 15 Safety Code for Mechanical Refrigeration.

B. Insulation and insulation adhesive shall comply with NFPA 90A requirements for flame spread and smoke generation.

C. Unit shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

D. Unit shall be constructed in accordance with ETL and CSA standards and shall carry the ETL and CSA labels.

1.02 DELIVERY, STORAGE AND HANDLING

Unit shall be stored and handled in accordance with the unit manufacturer’s instructions.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Unit shall be a factory-assembled, single-piece central station air handler. Unit may consist of a fan and coil

section with factory-installed chilled water or direct expansion coil, preheat or reheat coil, heating coil section, filter section, mixing box or combination filter/mixing box, or access section as indicated on the equipment schedules. Unit base rail shall be 14 gage galvanized steel

B- Unit Cabinet:

1. Unit panels shall be constructed of 20 gage galvanized steel. Casing panels shall be removable for easy access
   to the unit. All panels shall be gasketed to ensure a tight seal.
2. Optional double wall construction shall be available with inner panels constructed of 20 gage steel.
3. Hinged access doors shall be double wall with 1.5 lb dual-density fiberglass between galvanized steel
   panels.
4. Insulation for casing panels on unit shall be 1-in. minimum thickness dual-density fiberglass insulation with
   a nominal density of not less than 1.5 lb per cubic foot.
5. Insulation shall be secured to casing with waterproof adhesive.
6. Condensate drain pans shall be sloped to prevent standing water and constructed of stainless steel; they shall
   have double wall construction with threaded drain connection.

C- Fan Section:

1. Fan sections shall be constructed of galvanized steel and shall have a formed channel base for integral
   mounting of fan, motor, and casing panels. Fan scroll, wheel, shaft, and bearings are to be rigidly secured to the base unit.
2. Each unit shall have a single fan wheel and scroll. Fans shall be double width, double inlet type, with forward-curved blades. Wheels shall be bonderized steel with baked enamel, or galvanized steel.
3. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected to operate at least 25% below the first critical speed, and shall be statically and dynamically balanced as an assembly.
4. Fan shafts shall be solid steel, turned, ground and polished.
5. Fan bearings shall be self-aligning, pillow-block regreasable ball type selected for an average life of 200,000 hours at design operation conditions, per ANSI Code B3.15.
6. Fan motor shall be mounted within the fan section casing on slide rails having 2 adjusting screws. Motor shall be NEMA Design B with sizes and electrical characteristics as shown on the equipment schedule.

7. Fan drive shall be designed for a 1.5 service factor and shall be factory mounted and aligned. Belt drive shall be variable or fixed-pitch type.

D. Coil Section:

1. All coils shall have mill galvanized casings. Coils shall be factory leak tested at 450 psig air pressure.

2. Chilled water coils shall have aluminum plate fins with belled collars bonded to $^{1}/_{2}$-in. minimum OD copper tubes by mechanical expansion. Coils shall have galvanized steel casings and copper headers with threaded steel pipe connections. Working pressure shall be 300 psig at 200 F. Coils shall be drainable and have non-trapping circuits. No turbulence-promoting devices will be permitted inside the tubes. Headers shall have drain and vent connections.

3. Direct-expansion coils shall have aluminum plate fins with belled collars bonded to $^{1}/_{2}$-in. OD copper tubes by mechanical expansion. Coils shall be provided with pressure-type brass distributors with solder-type connections and shall have a minimum of 2 distributors. Coils for full face active or face-split operation shall have intertwined circuits for equal loading on each circuit. Suction and discharge connections shall be on the same end. Coils shall be designed and tested in accordance with ANSI/ASHRAE 15.

4. Hot water coils shall have aluminum plate fins with belled collars bonded to copper tubes by mechanical expansion. Coils shall have galvanized steel casings and copper headers with threaded steel pipe connections. Working pressure shall be 175 psig at 400 F. Headers shall have drain and vent connections.

5. Steam distributing coils (non-freeze type) shall have aluminum plate fins with an outer copper tube diameter of 1-in. with a $^{5}/_{8}$-in. diameter inner distributing tube, galvanized steel casings, and steel headers. Working pressure shall be 175 psig at 400 F

6. Electric heat coils for use in large air-handling units shall be open wire type, 80% nickel, 20% chromium resistance coils, insulated by floating steatite bushings and supported in a galvanized steel frame. Bushings shall be recessed into embossed openings and stacked into supporting brackets spaced on not more than 4-

in. centers. Thermal cutouts for primary and secondary over temperature protection shall be provided to meet UL and NEC requirements. Maximum element heating density shall be 55 watts/sq inch. An integral control box shall be furnished by the manufacturer. It shall contain thermal cutouts, primary and secondary control, sub-circuit fusing, airflow switch, and fused control transformer.

E. Filter Sections:

1. Each filter section shall be designed and constructed to house the specific type of filter specified on the equipment schedule.
2. Flat filter sections shall accept filters of standard sizes. Sections shall include side access slide rails and hinged door access. Flat filter section shall be arranged with minimum depth in direction of airflow.
3. Angle filter section shall accept 2-in. filters arranged in horizontal V formation. Double- walled hinged doors shall be provided.

F. Damper Sections:

1. Mixing boxes and filter mixing boxes shall have parallel blade, interconnecting outside-air and return-air dampers. Damper blades shall have parallel bends for stiffness and shall be welded to $^{1}/_{2}$-in. diameter steel rods rotating in nylon bushings and mounted in rigid galvanized steel frames. Dampers shall be sectionalized to limit blade width to no more than 50-in. to minimize blade warpage and to ensure tight closure. All mixing boxes and filter mixing boxes shall have double-walled hinged access doors.

2. All dampers for mixing boxes and filter mixing boxes shall be rated as low-leakage dampers, having a leakage rate not to exceed 2% of air quantity calculated at 2000 fpm velocity through damper and 4.0-in. wg pressure difference. Damper blades shall be gasketed and perimeter sealing strips shall be provided.

G. Access Sections:

1. Access sections shall be installed where indicated on the drawings and shall be as specified on the equipment

schedule.

2. Access sections shall have double-walled hinged doors.

H. Special Features:

The following unit options shall be available. The local Carrier Sales Office can provide assistance in amending the specifications.

1. Fan Section:

a. Variable inlet guide vanes.

b. High-efficiency motor.

c. Totally enclosed fan cooled (TEFC) motor for variable speed drive.

2. Coil Section:

a. Chilled water coil with copper plate fins and stainless steel casing.

b. Direct-expansion coil with copper plate fins and stainless steel casing.

c. Hot water (U-bend) coil with copper plate fins and stainless steel casing.

d. Steam distributing coil with copper fins.

END OF SECTION 15860

SECTION 260500
BASIC ELECTRICAL MATERIAL AND METHODS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all materials, labor, equipment and incidentals required to upgrade the HVAC system in this fire station:

The work to be accomplished under this contract includes, but is not limited to, partial demolition of the existing heating ventilation and air conditioning (HVAC) system, cleaning and sanitizing of the remaining ductwork. The new HVAC system also includes chillers, new air handler units (AHUs), new ceiling exhaust fans, and other items as per plans and specifications.

B. The work, apparatus and materials which shall be furnished under these Specifications and accompanying Drawings shall include all items listed hereinafter and/or shown on the Drawings. Certain equipment which will require wiring thereto and/or complete installation is indicated. All materials necessary for the complete installation shall be furnished and installed by the CONTRACTOR to provide complete power, lighting, wiring and control systems as indicated on the Drawings and/or as specified herein.

C. The CONTRACTOR shall furnish and install the necessary cables, protective devices, conductors, supports, raceways, exterior electrical system as indicated on the Drawings and/or as specified.

D. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; sub-standard work will be rejected.

E. It is **Highly Recommended** that each bidder or his authorized representatives, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this Section is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that he or his representative has visited the building and noted the locations and conditions under which the work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his work.

F. All power interruptions to existing equipment shall be at the OWNER's convenience. Each interruption shall have prior approval.

G.. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Section shall be furnished at no extra cost.

H. Furnish and install a complete underground system of ducts, manholes and handholes as herein specified and shown on the drawings.

1.2 SERVICE AND METERING

A. Permanent electrical power will be provided by the Florida Power & Light (FPL) at voltages indicated on the drawings.

1.3 CODES, INSPECTION AND FEES

A. All material and installation shall be in accordance with the latest edition of the National Electrical Code and all applicable national, local and state codes, laws and ordinances.

B. Pay all fees required for permits and inspections.

1.4 TESTS

A. Test all systems and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the OWNER's personnel in the proper operation of the systems.

B. The following minimum tests and checks shall be made prior to the energizing of electrical equipment. Test shall be by the CONTRACTOR and a certified test report shall be submitted providing all test results and stating that the equipment meets and operates in accordance with the Manufacturer's and job specifications, and that equipment and installation conforms to all applicable Standards and Specifications.

1. Testing all 600 volt wire insulation with a megohm meter after installation. Make tests at not less than 1000 volts. Submit a written test report of the results to the engineer.

2. Mechanical inspection of all circuit breakers to assure proper operation.

C. The Engineer shall be notified forty-eight (48) hours before tests are made to enable the Owner to have designated personnel present.

1 5 INTERPRETATION OF DRAWING

A. The Drawings are not intended to show exact locations of conduit runs.

B. All three –phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.

C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs," all necessary fittings and boxes shall be provided for a complete raceway installation.

E. All necessary offsets shall be furnished so as to take up a minimum space and all such offsets, fittings, etc., required to accomplish this shall be furnished and installed by the CONTRACTOR without additional expense to the Owner. In case interference develops, the Owner's authorized representative is to decide which equipment, piping, etc., must be relocated, regardless of which was installed first

F. Verify with the Engineer the exact locations and mounting heights of equipment, prior to installation.

G. The locations of equipment shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

H. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

I. Circuit layouts shown are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.

J. All connections to equipment shall be made as shown, specified and directed and in accordance with the approved shop drawings, regardless of the number of conductors shown on the Electrical Drawings

1.6 SIZE OF EQUIPMENT

A. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

1.7 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of project Contract Drawings. When the project is complete, furnish a complete set of reproducible "As-built" drawings for the Project Record Documents.

1.8 COMPONENT INTERCONNECTIONS

A. Component equipment furnished under this Specification will not be furnished as integrated systems. .

B. Analyze all systems components and their shop drawings; identify all terminals and prepare drawings or wiring tables necessary for component interconnection.

1.9 SHOP DRAWINGS

A. As specified under other Sections, shop drawings shall be submitted for approval for all materials, equipment, apparatus, and other items as required by the Engineer.

B. Shop drawings shall be submitted for the following equipment

1. 240-Volt Panelboard Disconnect switch.
2. Meter Can
3. Pedestrian fixtures and poles
4. Wire & cable
5. Conduit
6. Lighting contactor

C. The Manufacturer's name and product designation and catalog cutsheets shall be submitted for the following materials:

1. Conduit
2. Receptacles
3. Boxes and fittings

D. Prior to submittal by the CONTRACTOR, all shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

E. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings is included under the work of this Section.

F. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section.

G. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.

1.10 WARRANTY

A. Provide a warranty for all the electrical equipment in accordance with the requirements of other Sections. Under no circumstances shall the warranty be for less than one year starting from substantial completion.

PART 2 PRODUCTS

2.1 GENERAL

A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials of Manufacturer's specifications shall be submitted for approval as required by the Engineer.

B. Materials and equipment used hall be Underwriters Laboratories, Inc. listed and conform with applicable standards of NEMA and ANSI.

C. Electrical equipment shall, at all times during construction, be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR at his expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, at the cost and expense of the CONTRACT, or shall be replaced by the CONTRACTOR at his own expense.

D. All electrical panels, enclosures, raceways, conduits, wireways, boxes, cabinets, etc., shall be fabricated of metal. Nonmetallic substitutes are not acceptable. This does not apply to buried work.

2.2 RACEWAYS AND FITTINGS

A. Furnish and install complete raceway systems as shown on the Drawings and as specified herein.

B. All conduit of a given type shall be the product of one manufacturer.

C. All conduit shall be Rigid Nonmetallic Conduit Schedule 40 PVC.

1. Rigid nonmetallic conduit shall be for use under the provisions of NEC Article 347.

2. PVC conduit shall be rigid polyvinyl chloride schedule 40 as manufactured by Carlon, An Indian Head Co., Kraloy Products Co., Inc., Highland Plastics Inc., or approved equal.

2.3 CONDUCTORS

A. Conductors shall be copper. Power circuits shall have 600 volt PVC insulations (Underwriters' approval Type THNN/THWN). Conductors shall be color coded in accordance with the NEC.

B. All wires and cables shall be of annealed, 98 percent conductivity, soft drawn stranded copper conductors.

C. Type THNN/THWN shall be as manufactured by the Southwire Co., Collyer Insulated Wire Co., Rome Cable or approved equal.

2.4 UNDERGROUND SYSTEM

A. Materials
   1. Ducts shall be polyvinyl chloride (PVC Schedule 40) installed on clean fine sand. No rocks or debris shall be allowed as trench fill.

A. Ducts shall be installed to drain away from panels; ducts between pullboxes shall drain towards the pullbox. Duct slopes shall not be less than 3 inches per 100 feet.

B. Duct lines shall be laid in trenches on a clean backfill bedding.

C. The minimum cover for duct lines shall be as specified or required by NEC.

D. PVC duct terminations at pullboxes shall be with PVC and bells.

E. Where bends in ducts are required, long radius elbows, sweeps and offsets shall be used.

F. Spare ducts shall be plugged and sealed watertight at all pullboxes. Sealant shall be foam type.

G. Ducts in use shall be sealed watertight at all pullboxes. Sealant shall be foam type.

H. All joints shall be made so as to prevent the passage of concrete inside the conduit to form obstructions or cause cable abrasions.

I. A 5/8-inch by 10-foot copperclad ground rod shall be drived in the bottom of each pullbox. All bond wires and pullbox cover shall be bonded to the ground rod.

PART 3 EXECUTION

3.1 CONDUIT INSTALLATION

A. Where conduits enter or leave all outlets boxes, cabinets safety switches, tap boxes, motor controllers, etc., other than those having threaded hubs, a standard lock nut shall be used on the outside of the box. Busings 1-inch and larger shall be of an approved insulated type. Unless otherwise indicated, conduit 2-inches and larger shall be supported at intervals not exceeding twelve (12) feet and for smaller sizes at intervals not exceeding eight (8) feet.

B. During construction, all installed raceways shall be temporarily plugged or otherwise protected from the entrance of moisture, dirt, trash, plaster, moisture, etc., through neglect of the CONTRACTOR to so protect them, shall be replaced by the CONTRACTOR without additional expense to the Owner. No kinked, clogged or deformed raceways will be permitted on the job. Raceways shall be cut to proper length so that ends will fit accurately in the outlets. Where raceways cross building expansion joints, a suitable raceway expansion fitting shall be used.

C. Size of raceway shall not be less than NEC requirements, but in no case shall be less than indicated on the Drawings. Combining of circuits, other than detailed, will not be permitted. The CONTRACTOR shall install larger size raceways than detailed where there is excessive length of unbroken run or excessive number of bends.

D. Bends in metallic raceways shall be made while “cold” and in no case shall the raceways be heated. Raceways shall not be bent through more than 90. The radius of

bends shall not be less than six (6) times the internal diameter of the raceway. Not more than four (4) (equivalent 90) bends will be permitted between outlets, the bends at the outlets being counted.

E. Raceways shall be properly aligned, grouped and supported. Exposed raceways shall be installed at the right angles to or parallel to the principal structural members. Concealed raceways, unless otherwise indicated, may take the most direct route between outlets. Raceways shall be firmly held in place. Raceways shall run to avoid trapping wherever possible. Where areas are indicated for future openings, foundations, etc., all raceways shall be run around such areas. The CONTRACTOR shall provide necessary inserts in poured concrete areas and shall furnish and install all necessary sleeves through walls, floors and roofs for passage of raceways. Sleeves through roofs and/or exterior walls shall be properly sealed by the CONTRACTOR against entrance of moisture, etc., into building. Where necessary repairs to the building structure using material in no way inferior to that originally installed and using labor skilled in the trades involved.

3.2 BOXES

A. Install all outlet boxes, tap junction or pull boxes, device boxes, etc., necessary for the complete installation as indicated on the Drawings and/or specified herein. All boxes shall be rigidly mounted and shall be equipped with suitable screw fastened covers. All raceways entering boxes shall be mechanically and electrically secure. Open knockouts or holes in boxes shall be mechanically and electrically secure. Open knockouts or holes in boxes shall be plugged with suitable blacking devices. Boxes shall be cleared of all plaster, dirt, trash, etc., before the installation of any wiring devices and/or before the installation of cover plates.

B. All exterior pull boxes shall be precast concrete with traffic rated covers. Boxes shall be sized as per the NEC. Precast boxes shall be manufactured by Brooks Products Co., or approved equal.

3.3 TERMINATIONS & SPLICES

A. Splices, taps and attachments of fittings and lugs shall be electrically and mechanically secure. There shall be plenty of slack cable in boxes, outlets and cabinets to insure that there is no binding at the bushings. All lugs shall be of the correct sizes for the conductor in order to fit the conductor into a lug.

B. All wires shall be numbered indicating circuit number. Numbers shall be crimp type and installed on wire after wires enter pull box.

C. Power Conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be silicon filled wire nut splice, weatherproof and submergence proof, King or equal.

D. Except where otherwise approved by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.

E. Splices shall not be made in conduit bodies.

3.4 GROUNDING

A. The entire electrical system shall be completely and effectively grounded as required by the NEC and as specified hereinafter.

A. All metallic raceways shall be mechanically and electrically secure at all joints and at all boxes, cabinets, fittings and equipment. Metallic raceway entering the motor control center control panels or other electrical boxes shall be grounded to the appropriate ground bus. All metallic raceways shall be electrically continuous throughout the entire conduit system. Bond wires shall be used in exterior concrete pull boxes.

B. The ground plane shall consist of a minimum of 3-5/8" x 10' copper ground rods spaces at least 10' apart. Rods and system ground shall be connected with a #1/0 copper ground to the service entrance ground. The ground resistance shall be tested and additional rods or plates added to achieve a dry season resistance not exceeding 5 ohms.

3.5 CONDUCTOR COLOR CODING

A. All conductors shall be color coded as specified hereinafter. Color coding shall be by means of colored insulation material, colored braid or jacket over the insulations, or by means of suitable colored permanent, non-aging insulation tape equal to Scotch #471 or "Texcel 98" applied to conductors at each outlet, cabinet or junction point.

B. The following system of color coding shall be strictly adhered to:

1. Ground leads, green.

2. Grounded neutral leads, white.

3. Ungrounded phase wire of a delta connected 120/240 volt, 3-phase, 4-wire system, black, red and blue (high leg).

   Colors for 230-208 / 120v Circuits:
   a) Phase A: Black
   b) Phase B: Red
   c) Phase C: Blue

   Colors for 480/ 277v Circuits:
   d) Phase A: Brown
   e) Phase B: Orange
   f) Phase C: Yellow

4. All control leads, other than line connected "hot" leads, shall be yellow, orange and brown and/or I.P.C.E.A. standard control cable coding provided method of identification is different from method used on power conductors.

C. The color coding assigned to each phase wire shall be consistently followed throughout the Work.

3.6 SUPPORTS

A. The CONTRACTOR shall furnish and install all necessary supports for properly mounting all electrical equipment and raceways. Such supports shall be fabricated and installed in a neat and workmanlike manner, and care shall be taken that at no time

shall any portion of the building structure be overloaded. Should the building structure sustain damage through carelessness or through failure of the CONTRACTOR to properly support and install the electrical equipment, the CONTRACTOR shall bear all costs involved in repairing or replacing such installation.

B. All steel shapes exposed to the weather shall be galvanized after all cutting, drilling, and/or welding is done. All shop connections shall be welded or riveted and all field connections shall be bolted on all outdoor structures. Where the field cutting or drilling of galvanized steel is necessary, the CONTRACTOR shall apply one (1) coat of priming paint and one (1) finish coat of aluminum and oil paint.

3.7 TESTS AND CHECKS

A. The following minimum tests and checks shall be made, but prior to the termination of any field wiring.

1. Megger terminals and buses after disconnecting devices sensitive to megger voltage.

2. A 1,000V DC megger shall be used for these tests.

3. The first test shall be made with main circuit breaker closed and all remaining breakers open. A second test shall be made with all circuit breakers closed.

4. The test results shall be recorded and forwarded to the Engineer for his review. Minimum megger readings shall be 100 megohms in both tests.

END OF SECTION 260500

SECTION 260501
ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The general provisions of the Contract, including General Conditions, apply to all the work specified in the Electrical 1600 Sections.

B. It is the intent of the Specifications to construct a complete and working installation. Items of equipment or materials which may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically stated herein.

1.2 LAWS, PERMIT, FEES, AND NOTICES

A. Secure and pay all permits, fees and licenses necessary for the proper execution and completion of the work. Submit all notices and comply with all laws, ordinances, rules and regulations of any public agency bearing on the work, this shall include but not be limited to the authority having jurisdiction over the work.

1.3 DEPARTURES

A. If any departures from the Contract Drawings or Specifications are deemed necessary, details of such departments and the reasons therefore shall be submitted as soon as practicable to the Engineer for advance written approval.

1.4 BASIS FOR WIRING DESIGNS

A. The Contract Drawings and Specifications describe specific size of switches, breakers, fuses, conduits, conductors, motor starters, and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Wherever another trade provides power consuming equipment which differs from Drawings and Specifications, the wiring for such equipment shall be changed to proper sizes to match at no additional expense to the City.

1.5 GUARANTEES

A. Final Acceptance – Furnish written guarantee covering all materials, workmanship, and equipment for a period of one (1) year from the date of acceptance as described in the Contract General Conditions.

B. The City reserves the right to operate and use all materials and equipment failing to meet the requirement of the Contract Documents until such unacceptable materials and equipment are replaced or repaired to the satisfaction of the Engineer.

C. Provide certificate of proper installation from the manufacture or vendors of major equipment.

1.6 AS BUILT INFORMATION

A. A set of “red-lined” electrical drawings shall be carefully maintained at the job site. Actual conditions are to be put on the drawings in red on a daily basis so the drawings will continuously show locations and routings of cable trays, conduits, pull boxes, circuit numbers, and other information required by the Engineer. After completion of the project, a set of “red-lined” electrical drawings shall be submitted to the Engineer.

1.7 JOB SITE VISIT

A. Visit the project site before submitting a bid. Verify all dimensions shown on the contract drawings and determine the characteristics of existing facilities which will affect performance of the work, which are not shown on drawings or described within these specifications.

B. The electrical drawings were developed from past record drawings and information furnished by the owner. Verify all scaled dimensions prior to submitting bids.

C. Before submitting a bid, visit the site and determine conditions at the site and at all existing structures in order to become familiar with all existing conditions and electrical systems which will, in any way or manner, affect the work required under this Contract. No subsequent increase in Contract cost will be allowed for additional work required because of the Contractor’s failure to fulfill this requirement.

D. After award of Contract, confer with the Engineer to verify at each area of construction activity the location of existing underground utilities. Protect all existing underground utilities during construction. Pay for all required repairs without increase in Contract cost should damage to underground utilities occur during construction.

1.8 CLEANUP

A. Maintain a continuous cleanup during the progress of the work and use appointed storage areas for supplies. The premises shall be kept free from accumulations of waste materials and rubbish.

1.9 CUTTING AND PATCHING

A. Cut and prepare all openings, chases and trenches required for the installation of equipment and materials. Repair, remodel and finish in strict conformance with the quality of workmanship and materials in the surrounding. Obtain written permission from the Engineer for any alterations to structural members before proceeding. All penetrations through fire walls shall be sealed to maintain the fire integrity of the wall.

B. Installations including but not limited to, raceway systems and supports shall be completed in a fashion to avoid creating tripping hazards. Reroute any installation at the discretion of the Engineer should it be necessary. The cost of the alternate such as core drilling shall be in this contract.

1.10 MAINTENANCE

A. Render all necessary measures to ensure complete protection and maintenance of all systems, materials, and equipment prior to final acceptance. Any materials or equipment no properly maintained or protected to assure a factory new condition at the time of final

acceptance shall be replaced immediately with new equipment, at no additional cost to the City.

1.11 WATERPROOFING

A. Whenever any work penetrates any waterproofing, seal and render the work waterproof. All work shall be accomplished so as not to void or diminish any waterproofing bond or guarantee.

1.12 TESTS

A. The equipment shall be demonstrated to operate in accordance with the requirements of these specifications. The test shall be performed in the presence of the Engineer or an authorized representative. The electrical contractor shall furnish all instruments, electricity and personnel required for the test specified elsewhere in these specifications. The electrical contractor shall schedule manufacturer's representatives to be present as required.

1.13 POWER OUTAGES

A. The work shall be coordinated to require a minimum amount of time for power outages. The electrical contractor shall furnish all equipment, temporary power, portable generators and personnel required during the power outages. Requests shall be made in writing to the City at least 48 hours prior to the outage.

B. Carry out any work involving the shutdown of the existing services to any piece of equipment now functioning in existing areas at such time as to provide the least amount of inconvenience to the City. Do such work when directed by the Engineer.

1.14 SUMMARY OF ELECTRICAL WORK

A. Provide all labor, materials, tools, supplies, equipment and temporary utilities to complete the work shown on the drawings and specified herein. All systems are to be completely installed and fully operational. The work comprises of at least:

1. Power/control wiring installation and connection
2. Raceway systems including duct banks
3. Temporary power as required
4. Grounding and bonding
5. Testing of all systems
6. Miscellaneous
7. Electrical testing

1.15 ELECTRICAL COORDINATION

A. The electrical contractor is responsible for coordination with the City, Engineers, other trades, the power company and the telephone company on all matters which have a bearing on the electrical work.

B. The contract drawings indicate the extent, the general location and arrangement of equipment, conduit and wiring. Study the contract drawings, including details, so that equipment shall be properly located and readily accessible. Locate all electrical equipment to avoid interference with mechanical and/or structural features. Make necessary changes in spacing and location

C. of lighting fixtures, panelboards, cabinets, receptacles, and other items of equipment provided that the overall patters of layouts are not disrupted and remain uniform.

D. Coordinate with instrumentation contractor. Electrical contractor shall provide all conduit systems, wiring and terminations for instrumentation. Instrumentation contractor will supervise installation and termination. The electrical contractor shall further coordinate with all other divisions to assure proper interfacing of all equipment being furnished.

1.16 CODES AND STANDARDS

A. General – Applicable provisions of the following codes and standards and other codes and standards required by the State of Florida and local jurisdictions are hereby imposed on a general basis for electrical work (in addition to specific applications specified by individual work sections of these specifications):

1. U.L.: Electrical materials shall be approved by the Underwriter's Laboratories, Inc. This applies to materials which are covered by U.L. standards. Factory applied labels are required.
2. National Electric Code.
3. OSHA: Standards of the Occupational Safety and Health Administration are to be complied with.
4. NEMA: National Electrical Manufacturers Association Standards are to be met wherever standards have been established by that agency, and proof is specifically required with material submittals for switchboards, motor control centers, panelboards, cable trays, motors, switches, circuit breakers, and fuses.
5. ANSI: American National Standards Institute
6. NESC: National Electrical Safety Code
7. NECA: National Electrical Contractors Association
8. IEEE: Institute of Electrical and Electronic Engineers

1.17 ELECTRICAL TEMPORARY FACILITIES

A. The electrical contractor shall include in his bid the cost of furnishing, installing, maintaining, and removing all materials and equipment required to provide temporary light and power to perform the work of all trades during construction and until work is completed, .including the supply, operation and maintenance of portable generators if required. Adequate lighting and receptacle outlets for operation of hand tools shall be provided throughout the project, including shanties, trailers, field offices, temporary toilet enclosures, and shall be extended as construction progresses.

B. Electrical Safety:

1. All responsibility for electrical safety to protect workers and the public from electrical shock and any hazard shall be by the electrical contractors.

2. All reasonable safety requirements shall be observed to protect workers and the public from shock and fire hazards.

1.18 EXCAVATING FOR ELECTRICAL WORK

A. General – Excavation or drilling, backfill and repair of paving and grassing is to be in the bid of the electrical contractor. The actual work need not be performed by electrical trades.

B. However, the electrical contractor is responsible for all excavation, drilling, dewatering, backfilling, tamping, and repair of pavements and grassing required in support of electrical work. All areas disturbed by electrical work shall be repaired to their original condition, or as indicated on the drawings.

B. Coordination:

1. The electrical contractor must check for existing utilities before commencing any excavation or drilling.

2. Contract drawings and other trades are to be consulted to avoid interferences with other utilities on this project.

3. In the event of damage to existing utilities, the Engineer shall be immediately notified, and damage shall be immediately repaired by the Contractor with no expense to the City.

4. The City is to be consulted to ascertain locations of existing interferences by referring to “As-Built” drawings and City’s experience. The excavations are to be scheduled at the City’s convenience.

5. Exploratory excavation such as pot holing may be required to avoid damage to existing utilities and equipment. The cost of all exploration shall be included in this bid.

C. Precautions – The electrical contractor must take every reasonable precaution to avoid interferences. In the vicinity of a suspected interference, excavations shall be dug by hand.

D. Excavating, Drilling and Backfilling

1. All excavating and trenching shall be done after being verified by Sunshine.

2. Do not excavate for electrical work until the work is ready to proceed without delay, so that the total time lapse from excavation to completion of backfilling will be minimum.

3. Excavate with vertical-sided excavations to the greatest extend possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations, and to avoid damage to adjacent structures such as tanks, buildings, and etc. Remove sheeting and cross-bracing during backfilling wherever such removal will not endanger the work or other property. Where not removed, cut sheeting off at a sufficient distance below finished grade to not interfere with other work.

4. Locate and protect existing utilities and other underground work in a manner which will ensure that no damage or service interruption will result from excavating and backfilling.

5. Protect property from damage which might result from excavating and backfilling.

6. Dewater excavations as necessary. Protect excavations from inflow of surface water. Pump minor inflow of ground water from excavations; protect excavations and below grade property from being damaged by water, sediment or erosion from or through electrical work excavations.

7. No organic material is permitted in backfill. All vegetation, peat, sod, or other organic matter shall be removed from the premises.

8. Except under roadways, backfill materials shall be clean sand. No debris or trash may be used as backfill.

9. Under roadways, backfill material shall be the same as comprising the road bed.

10. Backfill excavations in 8” high courses of backfill material, uniformly compacted to 95% density per ASTM Standard D 1557 using power-driven hand-operated compaction equipment. Watering backfill is no t an adequate method of compaction. All work shall meet standards in Division 02200 and 02221.

11. Backfill to elevations matching adjacent grades, at the time of backfilling excavations for electrical work. Where subsidence is measurable or observable at electrical work excavations during the warranty period, remove the surface (pavement, lawn, or other finish) add backfill material, compact, and replace the surface treatment. Restore the appearance, quality, and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

12. Where excavation and backfill for electrical work pass through or occur in a landscaped area, repair or replace the landscape work at match the original condition and quality of the work.

13. Where excavation and backfill for electrical work pass through or occur in an area of paving or flooring, replace and restore the construction and finish of paving or flooring to match the original condition and quality of the work.

1.19 ELECTRICAL SUBMITTALS

A. Submittals for Approval:

1. Refer to Contract General Conditions for additional instructions on submittals and substitutions. Where conflicts occur between the General Conditions and this Section, the more stringent requirements shall apply.

2. Shop Drawings and manufacturer’s data sheets are required for all electrical materials.

3. Submittals will not be accepted for partial systems. Submit all materials for each specifications section at one time. Submittals must be arranged, correlated, indexed, and bound in orderly sets for ease of review.

4. Samples are to be supplied for any substitute as requested by the Engineer.

5. The following numbers of copies are required:

Shop Drawings	4 sets
Samples	1 each
Manufacturer’s data	4 sets
Certifications	4 sets
Test reports	4 sets
Warranties/Guarantees	4 sets

6. Submit shop drawings, manufacturer’s data, and certifications on all items of electrical work prior to the time such equipment and materials are to be ordered. Order no equipment or materials without approval from the Engineer. Submittals will not be

accepted for partial system submittals; submit all data at one time. Submittals will be promptly returned, approved, approved as noted, or not approved. Items "approved as noted" must be changed to comply with the Engineer's comments and need not be resubmitted for "approved" status. Items "not approved" are not suitable, requiring complete new submittals.

7. Time delays caused by rejection of submittals are not cause for extra charges to City or time extensions.

B. Maintenance Manuals

1. Submit to the City three (3) copies and to the Engineer one (1) copy of all manufacturer's services, installation and operation manuals, instructions and bulletins. Service manuals must contain, but are not limited to, the following:

   a. Brief description of system and basic features.
   b. Manufacturer's name and model numbers of all components of the system.
   c. List of local factory authorized service companies.
   d. Operating instructions, including preparation for starting up, seasonal changes, shut down and service.
   e. Maintenance instructions.
   f. Possible breakdowns and repairs.
   g. Manufacturer's literature describing each piece of equipment.
   h. Control diagrams by the control manufacturer.
   i. Description of sequence by the control manufacturer.
   j. Parts list.
   k. Wiring diagrams.

C. Spare Parts

Submit a list of recommended spare parts for all major items of equipment – include description of each part, part number and cost.

PART 2 – PRODUCTS

2.1 ELECTRICAL PRODUCTS

A. Standard Products

1. Unless otherwise indicated in writing by the Engineer, the products to be furnished under this specification shall be the manufacturer's latest design. Where two or more units of the same class of equipment are required, these units shall be products of the same manufacturer. Units of equipment and components of the same purpose and rating shall be interchangeable throughout the project.
2. All products shall be newly manufactured. Defective equipment or equipment damaged in the course of installation or test, shall be replaced or repaired in a manner meeting with the approval of the Engineer, at no additional expense to the City.

B. Delivery, Storage, and Handling – Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identification; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage. Comply with City's instructions for storage locations. Connect all temporary space heaters (which are part of the permanent installation) at the time equipment is delivered on site.

C. Substitutions – Comply with instructions in the Contract General Conditions and Special Conditions regarding substitutions.

2.2 ELECTRICAL IDENTIFICATION

A. Color Coding – Conductor colors shall be in accordance with the N.E.C., local agencies and NFPA requirements. Refer also to applicable sections of these specifications. Three phase feeder and branch circuits shall be identified as follows:

120 / 208	277 / 480
A – Black	A – Brown
B – Red	B – Purple
C – Blue	C – Yellow
Neutral – White	Neutral – Grey

Green or bare for grounding conductors
Green with yellow trace: Special Grounding

B. Nameplates

1. The following items shall be equipped with nameplates: All motors, motor starters, motor control centers, pushbutton stations, control panels, time switches, disconnect or relays in separate enclosures, receptacles, wall switches, panelboards, switchboards instrumentation cabinets, high voltage boxes and cabinets. All light switches and outlets shall carry a phenolic plate with the supply circuit number engraved. Special electrical systems shall be identified at junction and pull boxes, terminal cabinets, and equipment racks.

2. Nameplates shall adequately describe the function of the particular equipment involved. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. For example, "Panel A, 277/480V, 3-phase, 4-wire". The name of the machine on the motor nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and F.L. STATION NAMEPLATES FOR THAT MACHINE. Normal power nameplates shall be laminated phenolic plastic, white front and back with black core, with lettering etched through the outer covering; black engraved letters on white background. Lettering shall be 3/16 inch high at pushbutton stations, thermal overload switches, receptacles, wall switches and similar devices, where the nameplate is attached to the device plate. AT all other locations, lettering shall be ¼ inch high, unless otherwise detailed on the Drawings. Nameplates shall be securely fastened to the equipment with No. 4 Phillips, round-head, cadmium plated, steel self-tapping screws or nickel-plated brass bolts. Motor nameplates may be non-ferrous metal not less than 0.03 inch thick, die stamped. In lieu of separate plastic nameplates, engraving directly on device plates is acceptable. Engraved lettering shall be filled with contrasting enamel. Equipment nameplate schedule for all equipment shall be submitted with shop drawing submittal for Engineer's approval.

3. All junction and splice boxes shall be labeled using permanent shipping tags attached to boxes; not covers.

C. Wire and Cable Identification – All wire and cable shall be identified at each termination point and at each pull box, splice box, junction box, or manhole. Provide permanent, waterproof, non-metalllic heat shrinkable tube cable markers in 3/16 inch letters.

E. Signs – Warning signs shall comply with OSHA requirements and reasonable safety precautions.

F. Underground Identification – During backfilling of each exterior underground electrical, signal, or communication cable, conduit, or ductbank, install a continuous underground-type plastic with foil backed line, marker, located directly over the buried line at six (6) inches to eight (8) inches below finished grade.

G. Rubber Mat – Provide U.L. approved rubber mat running the full length on all switchboards, MCC's, control panels, etc.

PART 3 – EXECUTION

3.1 TESTS

A. Carry out tests specified hereinafter and as indicated under individual items of materials and equipment specified in other sections and in Section 16950, Electrical Testing. Coordinate tests performed by manufacturer, suppliers, and equipment representatives of other equipment containing electrical apparatus.

3.2 OPERATIONS

A. After the electrical system installation is completed and at such time as the Engineer may indicate, conduct an operating test for approval. Demonstrate that the equipment operate in accordance with the requirements of these Specifications and Drawings. Demonstrate that protective functions are operating properly and are properly incorporated in control system, circuit breaker, and motor control center circuitry. Perform the test in the presence of the Engineer. Furnish all instruments and personnel required for the tests. The City will furnish the necessary electric power.

3.3 VOLTAGE

A. When the installation is essentially complete and the plant is in operation, check the voltage at the point of termination of the power company supply system to the project. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

B. Record the supply voltage (all three phases simultaneous on the same graph) for 24 hours during a normal working day. Submit the recording with a letter of transmittal to the City and the Engineer within 5 days of the date the test was taken.

C. If an unbalance (as defined by NEMA) exceeds 1 percent, or if the voltage varies throughout the day and from loaded to unloaded conditions more than plus or minus 4 percent of nominal, make a written request to the power company, with a copy to the Engineer, that the condition be corrected. If corrections are not made, obtain from a responsible power company official a written statement that the voltage variations and/or unbalance are within their normal standards. Send a copy of this statement with a transmittal letter to the Engineer.

3.4 EQUIPMENT LINE CURRENT

A. Check the line current in each phase for each piece of equipment. If the power company makes adjustments to the supply voltage magnitude or balance, make the line current check after the adjustments are made. If any phase current in any piece of equipment is above the rated nameplate current, determine the cause of the problem and submit it in wiring to the Engineer.

B. Tests Reports – Submit written test results in a format by phase to phase and phase to ground, for voltage and each phase for current. The format for these submittals test results will be provided to the Engineer.

END OF SECTION 16010

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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 the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. Division 26 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
2. Division 26 Section "Undercarpet Electrical Power Cables" for flat cables for undercarpet installations.
3. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

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

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical

Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN XHHW.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.

4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: City will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

   a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
   b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 methods and materials for grounding systems and equipment.

1. Overhead-lines grounding.
2. Underground distribution grounding.
3. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

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

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.
5. Grounding for sensitive electronic equipment.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.

a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper] wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm**)** in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad 3/4 inch by10 feet (19 mm by 3 m) in diameter.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

D. Concrete Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service

pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building foundation.

J. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

C. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal**[,** at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 5 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260530
ELECTRICAL TESTING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

1.2 SUBMITTALS

A. Administrative Submittals: Submit 10 days prior to performing inspections or tests:

1. Schedule for performing inspection and tests.
2. List of references to be used for each test.
3. Sample copy of equipment, materials specifications and forms.
4. Sample copy of individual device test form.
5. Sample copy of individual system test form.

B. Quality Control Submittals: Submit within 30 days after completion of test:

1. Test or inspection reports and certificates for each electrical item tested.

C. Contract Closeout Submittals:

1. Operation and maintenance data.
2. After test or inspection reports and certificates have been reviewed by the ENGINEER and returned, insert a copy of each in the operation and maintenance manual.

1.3 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform tests with apparatus de-energized whenever feasible.

C. Inspection and electrical tests on energized equipment shall be:

1. Scheduled with the ENGINEER and OWNER prior to de-energization.

2. Notify ENGINEER and OWNER at least 24 hours prior to performing tests on electrical equipment.
3. Schedule and coordinate all required manufacturer's representatives.

1.4 SPECIFIC TESTS

A. Conductors 600 volts or less:

1. Perform insulation resistance testing of all power circuits below 600 volts with a 1000 Volt Megger.

2. Prepare a written test report of the results and submit to Engineer prior to final inspection.

3. Minimum acceptable value for insulation resistance is 1 megohm.

4. Disconnect equipment that might be damaged by this test. Perform tests with all other equipment connected to the circuit.

5. As part of final completion, and before schedule for substantial completion, contractor shall test all panels' feeder connections, incoming main feed locks, splices, and connections with infrared temperature sensing device to ensure all materials are not defective and all joints are tight.

B. Grounding systems

1. Fall-of-Potential Test:

   a. In accordance with IEEE 81, Section 8.2.1.5 for the measurement of the main systems ground resistance.
   b. Main ground electrode system resistance to ground to be no greater than 5 ohms.

2. Two-Point Direct Method Test:

   a. In accordance with IEEE 81, Section 8.2.1.1 for measurement of ground resistance between main ground system, equipment frames, and system neutral and derived neutral points.
   b. Equipment ground resistance shall not exceed main grounding resistance by 0.50 ohm.

3. Control wiring test:

   a. Apply secondary voltage to control power and potential circuits.
   b. Check voltage levels at each point on terminal boards and each device terminal.
   c. Insulation resistance test at 1,000 volts dc on control wiring except that connected to solid state components. Insulation resistance to be 1 megohm minimum.

4. Operational test by initiating control devices to affect proper operation.

END OF SECTION 16950

SECTION 260533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

a. Duct entry provisions, including locations and duct sizes.
b. Frame and cover design.
c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

C. Rigid Steel Conduit: ANSI C80.1.

D. Aluminum Rigid Conduit: ANSI C80.5.

E. IMC: ANSI C80.6.

F. PVC-Coated Steel Conduit: PVC-coated [**rigid steel conduit**] [**IMC**].

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: ANSI C80.3.

H. FMC: Zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: set-screw or compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

K. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

C. ENT: NEMA TC 13.

D. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

E. LFNC: UL 1660.

F. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

C. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have openbottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. CDR Systems Corporation.
    d. NewBasis.

C. Fiberglass Handholes and Boxes with Polymer-Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester-resin enclosure joined to polymer-concrete top ring or frame.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. Christy Concrete Products.
    d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of fiberglass.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

    a. Carson Industries LLC.
    b. Christy Concrete Products.
    c. Nordic Fiberglass, Inc.

2.5 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.6 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings, or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit, IMC, RNC, Type EPC-40-PVC.
2. Concealed Conduit, Aboveground: Rigid steel conduit, EMT.
3. Underground Conduit: RNC, Type EPC-40 PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

    a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Fiberglass-reinforced polyester resin, SCTE 77, Tier 15 structural load rating.
    b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Heavy-duty fiberglass units with polymer-concrete frame and cover, SCTE 77, Tier 8 structural load rating.
    c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbs (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic, in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).

2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).

3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.

b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

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 the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, **0.015 inch (0.38 mm)** thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, blackink or paint. Minimum letter height shall be 1 inch (25 mm).

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Acrylic-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Exterior concrete and masonry primer.
2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: One finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Exterior semigloss acrylic enamel.

3. Exterior Ferrous Metal:

a. Semigloss Alkyd-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Exterior ferrous-metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

4. Exterior Zinc-Coated Metal (except Raceways):

a. Semigloss Alkyd-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Exterior zinc-coated metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Alkyd-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Interior concrete and masonry primer.
2) Finish Coats: Interior semigloss alkyd enamel.

6. Interior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Interior semigloss acrylic enamel.

7. Interior Gypsum Board:

a. Semigloss Acrylic-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Interior gypsum board primer.
2) Finish Coats: Interior semigloss acrylic enamel.

8. Interior Ferrous Metal:

a. Semigloss Acrylic-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Interior ferrous-metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

9. Interior Zinc-Coated Metal (except Raceways):

a. Semigloss Acrylic-Enamel Finish: One finish coat(s) over a primer.

1) Primer: Interior zinc-coated metal primer.
2) Finish Coats: Interior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Raceways and Duct Banks More Than 600 V Concealed within Buildings: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER

CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches (50 mm) high, with self-adhesive vinyl labels. Repeat legend at 10-foot (3-m) maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label.

D. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands**.**

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.
3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.
6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

E. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

F. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source and circuit number.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Limit use of underground-line warning tape to direct-buried cables.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

K. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Adhesive film label with clear protective overlay. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Contactors.
c. Master clock and program equipment.
d. Monitoring and control equipment.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

J. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION 260553

SECTION 262816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Bolted-pressure contact switches.
4. High-pressure, butt-type contact switches.
5. Molded-case circuit breakers.
6. Molded-case switches.
7. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 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. Spares: For the following:

a. Potential Transformer Fuses: 4
b. Control-Power Fuses: 6
c. Fuses and Fusible Devices for Fused Circuit Breakers: 2
d. Fuses for Fusible Switches: 4
e. Fuses for Fused Power Circuit Devices: 4

2. Spare Indicating Lights: Six (6) of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Available Manufacturers:

1. General Electric Co.; Electrical Distribution & Control Division.
2. Siemens Energy & Automation, Inc.
3. Square D/Group Schneider.

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type GD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 600 A and Smaller: NEMA KS 1, Type GD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 FUSED POWER CIRCUIT DEVICES

A. Bolted-Pressure Contact Switch: UL 977; operating mechanism shall use a rotary-mechanical-bolting action to produce and maintain high-clamping pressure on the switch blade after it engages the stationary contacts.

1. Available Manufacturers:

a. Boltswitch, Inc.
b. Pringle Electrical Mfg. Co.
c. Siemens Energy & Automation, Inc.
d. Square D/Group Schneider.

B. High-Pressure, Butt-Type Contact Switch: UL 977; operating mechanism shall use butt-type contacts and a spring-charged mechanism to produce and maintain high-contact pressure when switch is closed.

1. Available]Manufacturers:

a. General Electric Co.; Electrical Distribution & Control Division.

2. Main Contact Interrupting Capability: Twelve times the switch current rating, minimum.
3. Operating Mechanism: Manual handle operation to close switch stores energy in mechanism for closing and opening.

    a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
    b. Mechanical Trip: Operation of mechanical lever or push button or another device causes switch to open.

4. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Ground-Fault Relay: Comply with UL 1053. Self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

    a. Configuration: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.
    b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
    c. No-Trip Relay Test: Operation of "no-trip" test control permits ground-fault simulation test without tripping switch.
    d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).

7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

2.4 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. General Electric Co.; Electrical Distribution & Control Division.
2. Moeller Electric Corporation.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
6. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
8. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.
4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Provide "dummy" trip unit where required for proper operation.
5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.5 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Hangers and Supports for Electrical Systems," and concrete materials and installation requirements are specified in Division 03.

3.3 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect**,** test**,** and adjust field-assembled components and equipment installation, including connections**,** and to assist in field testing. Report results in writing.

B. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

C. Tests and inspections and prepare test reports.

D. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

E. Perform the following field tests and inspections and prepare test reports:

1. Test mounting and anchorage devices according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Infrared Scanning:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
    b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
    c. Instruments, Equipment and Reports:

        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
        2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SCHEDULE OF VALUES (P12200 Re-Bid)

The Schedule of Values is an itemized list that establishes the cost of certain items. It shall be used as the basis for pricing of additional work or credits that might arise during construction. **Contractor shall complete all items in the Schedule of Values. These items are NOT part of the bid price.**

Specify unit prices for each item shown, including material, labor, and equipment. All proposed line items shall include insurance, bond, overhead and profit, and all other fixed costs.

ITEM NO.	ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE
1	ductwork	Furnish all materials, labor, and equipment to install galvanized sheet metal 24 gauge ductwork.	1	pound	$
2	Duct insulation	Furnish all materials, labor, and equipment to insulate the new metal duct, and repair of existing insulation with 1 1/2" fiberglass insulation per specification.	1	square foot	$
3	Upgrade the flexible branch ducts	Furnish all materials, labor, and equipment to remove all existing flex ducts, Supply new flex duct and replace or upgrade drops per drawings.	1	drop	$
4	24"x24" grills	Furnish all materials, labor, and equipment to supply and install 24"x24" lay-in, four way diffusers with butterfly damper, adjustable through 3/8" diameter hole in center of grill, with Allen wrench. The hole shall be plugged with manufacturer provided plug.	1	unit	$
5	24"x24" Return grills	Furnish all materials, labor, and equipment to supply and install 24"x24", lay-in or wall mounted Return Grills, hinged and filter back, with pleated filter.	1	unit	$
6	4" PVC pre insulated pipe	Furnish all materials, labor, and equipment to supply and install 4" PVC pre-insulated urethane pipe, per drawing, including all fittings	1	foot	$
7	3" PVC pre insulated pipe	Furnish all materials, labor, and equipment to supply and install 3" PVC pre-insulated urethane pipe, per drawing, including all fittings.	1	foot	$
8	2 1/2" PVC pre insulated pipe	Furnish all materials, labor, and equipment to supply and install 2 1/2" PVC pre-insulated urethane pipe, per drawings, including all fittings.	1	foot	$
9	2" OR 1 1/2" PVC pre insulated pipe	Furnish all materials, labor, and equipment to supply and install 2" or 1 1/2" PVC pre-insulated urethane pipe, per drawing, including all fittings.	1	foot	$
10	Thermostat	Furnish all materials, labor, and equipment to supply and install seven-day programmable wall mounted thermostats.	1	unit	$

LABOR RATES

ITEM NO.	TRADE	TITLE	UNIT	RATE
1	Mechanical	Project supervisor	hourly	$
2	Mechanical	HVAC technician/mechanic	hourly	$
3	Mechanical	Sheet metal worker	hourly	$
4	Mechanical	Installer	hourly	$
5	Electrical	Electrician	hourly	$
6	Electrical	Journeyman	hourly	$
7	Plumbing	Plumber	hourly	$
8	Plumbing	Apprentice/helper	hourly	$
9	General	Carpenter	hourly	$
10	General	Painter	hourly	$

DRAWING INDEX

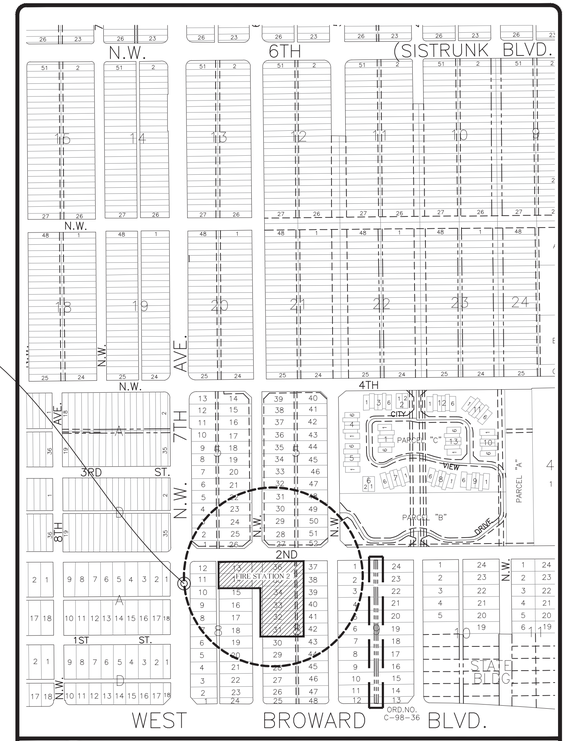
CITY OF FORT LAUDERDALE

PROJECT #12200
FIRE STATION 2
HVAC UPGRADE

528 NW 2ND STREET

FORT LAUDERDALE, FLORIDA

PROJECT SITE LOCATION



LOCATION SKETCH

PROJECT #12200
FIRE STATION 2
HVAC UPGRADE
528 NW 2ND STREET

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

FORT LAUDERDALE CITY COMMISSION

JOHN P. "JACK" SEILER	MAYOR
BRUCE G. ROBERTS	COMMISSIONER - DISTRICT I
DEAN J. TRANTALIS	COMMISSIONER - DISTRICT II
ROBERT L. McKINZIE	COMMISSIONER - DISTRICT III
ROMNEY ROGERS	COMMISSIONER - DISTRICT IV

IRINA TOKAR, R.A.	SENIOR PROJECT MANAGER	954-828-6891
ALEX RIO	PROJECT MANAGER I	954-828-5389
FRED MEHR, P.E.	MEP ENGINEER	954-828-5059

DATE: 18/01/2017

CAD FILE: 12200-000-COVR

DRAWING FILE No.: 4-140-05

BID SET

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11/20/2017 9:24 AM

GENERAL CONSTRUCTION NOTES:

1. NO CONNECTIONS FOR THE PURPOSE OF OBTAINING WATER SUPPLY DURING CONSTRUCTION SHALL BE MADE TO ANY FIRE HYDRANT OR BLOW-OFF STRUCTURE WITHOUT FIRST OBTAINING PERMISSION AND A CONSTRUCTION METER FROM THE CITY OF FORT LAUDERDALE.
2. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING, MOVING AND RELOCATING OR REPLACING ALL WATER SERVICES OR SEWER LATERALS WHICH ARE ENCOUNTERED DURING EXCAVATION. THE CONTRACTOR SHALL SUBMIT A WRITTEN PLAN FOR WATER SERVICE AND WASTEWATER SERVICE DISRUPTION FOR APPROVAL 7 (SEVEN) CALENDAR DAYS PRIOR TO THE ANTICIPATED DISRUPTION. THE CONTRACTOR SHALL NOTIFY THE PROPERTY OWNERS 48 HOURS IN ADVANCE OF ANY WORK ON THEIR SERVICES. THIS WORK SHALL BE CONSIDERED INCIDENTAL.
3. THE CONTRACTOR MUST USE EXTREME CARE TO AVOID DAMAGE OR DISRUPTION TO ANY EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT. ALL PLAN LOCATIONS ARE APPROXIMATE AND SHALL BE FIELD VERIFIED. CONTRACTOR IS TO CONTACT SUNSHINE STATE ONE CALL OF FLORIDA AT 1-800-432-4770 AND ALL OTHER PARTICIPATING UTILITIES 2 FULL BUSINESS DAYS PRIOR TO CONSTRUCTION FOR FIELD MARKUP LOCATIONS OF EXISTING UTILITIES AND FACILITIES.
4. THE CONTRACTOR MUST INFORM THE CITY AT LEAST 48-HOURS IN ADVANCE OF CONSTRUCTION, IN WRITING IF ANY CONFLICT IS DISCOVERED DURING POT HOLE OPERATIONS FOR CLARIFICATION BY THE CITY.
5. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE UTILITIES DEPARTMENT OF THE CITY OF FORT LAUDERDALE AT LEAST TWO (2) BUSINESS DAYS IN ADVANCE TO COORDINATE ANY ACTIVITY TO BE PERFORMED BY THE CITY'S UTILITIES DEPARTMENT.
6. CONTRACTOR SHALL NOT DISTURB AREAS OUTSIDE EXISTING RIGHTS-OF-WAY.
7. IN GENERAL, EXISTING STRUCTURES AND UTILITIES ARE NOTED AS EXISTING AND/OR SHOWN IN THIN LINES. NEW CONSTRUCTION IS IN HEAVY LINES AND/OR UNDERLINED.
8. ALL WORK WITHIN STATE DEPARTMENT OF TRANSPORTATION (FDOT) RIGHT-OF-WAYS SHALL BE IN CONFORMANCE WITH FDOT SPECIFICATIONS AND PERMIT REQUIREMENTS.
9. ALL WORK WITHIN BROWARD COUNTY RIGHT-OF-WAYS SHALL BE IN CONFORMANCE WITH THE BROWARD COUNTY MINIMUM STANDARDS AND/OR REQUIREMENTS.
10. CONTRACTOR SHALL COMPLY WITH ALL LOCAL CITY, COUNTY AND STATE REGULATIONS PERTAINING TO THE CLOSING OF PUBLIC STREETS FOR USE OF TRAFFIC DURING CONSTRUCTION.
11. CONTRACTOR SHALL PREPARE AND SUBMIT MAINTENANCE OF TRAFFIC (MOT) PLANS TO FDOT, CITY OF FORT LAUDERDALE, BROWARD COUNTY AS REQUIRED FOR WORK TO BE DONE WITHIN THEIR R/W PRIOR TO COMMENCEMENT OF WORK. SPECIFIC AGENCY MOT REQUIREMENTS ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
12. STATIONS SHOWN ON THE DRAWINGS ARE BASED ON THE ESTABLISHED BASELINE AND SHALL NOT BE CONSIDERED AS DISTANCES OR AS A MEASURE OF THE LINEAR FOOTAGE OF PIPE TO BE INSTALLED.
13. THE GENERAL INTENT IS TO PROVIDE SEWER SERVICE LATERALS FOR EACH PROPERTY. ALL LATERAL LOCATIONS SHALL BE FIELD ADJUSTED.
14. CONTRACTOR SHALL MAINTAIN ACCESS TO PRIVATE PROPERTY AT ALL TIMES.
15. ALL OPEN TRENCHES AND HOLES ADJACENT TO ROADWAY OR WALKWAY SHALL BE PROPERLY MARKED AND BARRICADED TO ASSURE THE SAFETY OF BOTH VEHICULAR AND PEDESTRIAN TRAFFIC.
16. TRENCHES OR HOLES NEAR WALKWAYS, IN ROADWAYS OR THEIR SHOULDERS SHALL NOT BE LEFT OPEN DURING NIGHT TIME HOURS WITHOUT ADEQUATE PROTECTION.
17. CONTRACTOR SHALL PROMPTLY REPAIR AND RESTORE EXISTING PAVEMENT, SIDEWALKS, CURBS, DRIVEWAYS, PIPES, RESIDENTIAL AND COMMERCIAL SPRINKLER LINES, CONDUIT, CABLES, ETC. AND LANDSCAPE AREAS DAMAGED AS A RESULT OF CONSTRUCTION ACTIVITIES.
18. CONTRACTOR SHALL PROVIDE TEMPORARY FENCING AS REQUIRED BY AGENCIES HAVING JURISDICTION OVER THE PROJECT AND/OR WHEN REQUIRED FOR PUBLIC SAFETY.
19. THE CONTRACTOR SHALL BE RESPONSIBLE AT ALL TIMES THROUGHOUT THE DURATION OF CONSTRUCTION AND UNTIL ACCEPTANCE OF WORK, FOR THE PROTECTION OF EXISTING AND NEWLY INSTALLED UTILITIES FROM DAMAGE OR DISRUPTION OF SERVICE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING SUCH MEASURES AS NECESSARY TO PROTECT THE HEALTH, SAFETY AND WELFARE OF THOSE PERSONS HAVING ACCESS TO THE WORK SITE.
20. LOCATION OF AIR RELEASE VALVES MAY BE FIELD ADJUSTED BY THE ENGINEER OR CITY OF FORT LAUDERDALE AS NECESSARY.
21. CONTRACTOR SHALL ADJUST TO GRADE ALL EXISTING UTILITY CASTINGS INCLUDING VALVE BOXES, MANHOLES, HAND HOLES, PULL BOXES, INLETS AND SIMILAR STRUCTURES IN CONSTRUCTION AREA TO BE OVERLAYED WITH ASPHALT.
22. EXISTING TRAFFIC SIGNS SHALL BE RESET UPON COMPLETION PER BROWARD COUNTY TRAFFIC ENGINEERING STANDARDS. COST SHALL BE CONSIDERED INCIDENTAL. CONTRACTOR SHALL REPAIR OR REPLACE DAMAGED TRAFFIC SIGNAL LOOPS PER BROWARD COUNTY TRAFFIC ENGINEERING SPECIFICATIONS; COST SHALL BE INCIDENTAL.
23. CONTRACTOR SHALL RESTORE EXISTING PAVEMENT AND PAVEMENT MARKINGS/SIGNAGE TO ORIGINAL PRE-CONSTRUCTION CONDITION OR AS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS. THIS WORK SHALL BE CONSIDERED INCIDENTAL.
24. ALL CONSTRUCTION WITHIN FDOT R/W MUST CONFORM WITH FDOT SPECIFICATIONS, STANDARDS, AND PERMIT REQUIREMENTS. NO WORK SHALL COMMENCE WITHIN FDOT R/W's WITHOUT AN FDOT PERMIT. FULL LANE WIDTH RESTORATION TO MATCH EXISTING PAVEMENT SECTION IS REQUIRED IN ACCORDANCE WITH FDOT STANDARDS FOR PROPOSED WORK WITHIN FDOT R/W.
25. SEWER LATERALS SHALL BE PROVIDED FOR EACH PROPERTY. MISSING SEPTIC TANKS (NOT SHOWN ON SEWER LATERALS SERVICES PLAN) WILL BE FIELD LOCATED AS CONSTRUCTION PROGRESSES AND THE FINAL LATERAL LOCATION (AND TYPE) WILL BE THEN DETERMINED WITH THE APPROVAL OF THE ENGINEER/CITY. SEPTIC TANK LOCATIONS SHOWN IN PLANS ARE APPROXIMATE, BASED ON RESIDENTS SEWER LATERAL QUESTIONNAIRES PROVIDED BY THE CITY.
26. CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS AND ELEVATIONS BEFORE STARTING CONSTRUCTION.
27. ELEVATIONS SHOWN HEREON ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM 1929.

GENERAL NOTES - TRAFFIC CONTROL PLAN

1. THE TRAFFIC CONTROL PLANS FOR THE PROJECT SHALL COMPLY WITH THE LATEST EDITION OF THE ROADWAY AND TRAFFIC DESIGN STANDARDS, INDEX NO. 600-660. MUTCD AND THE STANDARD SPECIFICATIONS. THE CONTRACTOR'S RESPONSE TIME TO ALL REPORTED MALFUNCTIONS OF TRAFFIC SIGNALS WITHIN THE PROJECT LIMITS SHALL BE NO MORE THAN TWO (2) HOURS AND SHALL RESTORE ALL MALFUNCTIONING TRAFFIC SIGNAL EQUIPMENT TO ITS LEVEL OF OPERATION PRIOR TO THE MALFUNCTIONING WITHIN TWENTY-FOUR (24) HOURS. DURING THIS TIME THE CONTRACTOR SHALL PROVIDE AT HIS EXPENSE TEMPORARY TRAFFIC CONTROL DEVICES, FLAGGLER PERSONNEL AND LAW ENFORCEMENT PERSONNEL AS NECESSARY TO MAINTAIN A SAFE AND EFFICIENT FLOW OF TRAFFIC AT THE AFFECTED WORK ZONE. THE ENGINEER OR THE CITY OF FORT LAUDERDALE SHALL APPROVE ALL MODIFICATIONS PRIOR TO THEIR IMPLEMENTATION.
2. THE CONTRACTOR SHALL MAINTAIN PROPER OPERATION OF ALL TRAFFIC SIGNAL LOOP ASSEMBLIES AND LOOP DETECTORS WITHIN THE PROJECT LIMITS. THE CONTRACTOR SHALL CORRECT ALL LOOP ASSEMBLY/DETECTOR MALFUNCTIONS WITHIN 24 HOURS OF NOTIFICATION OF SUCH MALFUNCTIONS BY THE ENGINEER.
3. THE AGENCY RESPONSIBLE FOR MAINTENANCE OF THE TRAFFIC SIGNALS AND RELATED EQUIPMENT IS BROWARD COUNTY TRAFFIC ENGINEERING.
4. A REGULATORY SPEED OF 25 MPH SHALL BE POSTED WITHIN THE LIMITS OF THE WORK ZONE.
5. EXISTING SIGNS AND PAVEMENT MARKINGS THAT CONFLICT WITH CONSTRUCTION SIGNS AND MARKINGS SHALL BE REMOVED DURING CONSTRUCTION. ALL EXISTING SIGNS THAT ARE REMOVED SHALL BE STOCKPILED IN A SECURE PLACE AND REINSTALLED AFTER CONSTRUCTION. REMOVE AND REPLACE ANY GROUND MOUNT SIGN BY USE OF INDEX NO. 611.
6. THE CONTRACTOR SHALL MAINTAIN EXISTING DRAINAGE PATTERNS AND PREVENT ADVERSE FLOODING OF THE TRAVEL LANES DURING CONSTRUCTION.
7. THE CONTRACTOR SHALL OBTAIN WRITTEN AUTHORIZATION FROM THE CITY OF FORT LAUDERDALE FOR ANY AND ALL CONSTRUCTION ACTIVITIES TO BE PERFORMED AT NIGHT. NO LANE CLOSURE SHALL BE ALLOWED BETWEEN THE HOURS OF 6:00 AM TO 9:00 AM AND 4:00 PM TO 7:00 PM, MONDAY THROUGH FRIDAY UNLESS APPROVED BY THE ENGINEER.
8. THE CONTRACTOR SHALL NOTIFY THE APPROPRIATE UTILITY COMPANY TWO (2) BUSINESS DAYS IN ADVANCE OF ANY EXCAVATION INVOLVING ITS UTILITIES SO THAT A COMPANY REPRESENTATIVE CAN BE PRESENT. THE LOCATION OF THE UTILITIES SHOWN IN THE PLANS ARE APPROXIMATE ONLY. THE EXACT LOCATION SHALL BE DETERMINED BY THE CONTRACTOR DURING CONSTRUCTION. SEE SPECS FOR LIST OF UTILITY COMPANIES.
9. TRAFFIC CONTROL ON ALL COUNTY RIGHTS-OF-WAY SHALL MEET THE ADDITIONAL REQUIREMENTS OF THE BROWARD COUNTY ENGINEERING DEPARTMENT.
10. THE AGENCY RESPONSIBLE FOR MAINTENANCE OF THE TRAFFIC SIGNALS AND RELATED EQUIPMENT IS BROWARD COUNTY TRAFFIC ENGINEERING.
11. CONTRACTOR SHALL PREPARE AND SUBMIT MAINTENANCE OF TRAFFIC PLAN (MOT) WHERE REQUIRED BY FEDERAL, STATE, COUNTY, OR LOCAL AGENCIES HAVING JURISDICTION. CONTRACTOR SHALL OBTAIN ALL REQUIRED APPROVALS AND PERMITS ASSOCIATED WITH THE MOT'S. ALL MOT'S TO BE ATS CERTIFIED.
12. THE CONTRACTOR SHALL ALSO COORDINATE THE CONSTRUCTION SCHEDULE WITH FDOT, BROWARD COUNTY AND THE CITY OF FORT LAUDERDALE TO AVOID LANE CLOSURES WHICH WOULD ADVERSELY AFFECT TRAFFIC DURING RUSH HOUR.

LEGEND

ABBREVIATIONS

C.L.F.	=	CHAIN LINK FENCE
CMP	=	CORRUGATED METAL PIPE
CONC.	=	CONCRETE
F.H.	=	FIRE HYDRANT
GAS	=	GAS MAIN
INV.	=	PIPE INVERT
OHW	=	OVERHEAD WIRES
R/W	=	RIGHT-OF-WAY LINE
RCP	=	REINFORCED CONCRETE PIPE
SAN	=	SANITARY SEWER PIPE
SMH	=	SANITARY MANHOLE
S.V.	=	SEWER VALVE
T.O.P.	=	TOP OF PIPE
UNK.	=	UNKNOWN TREE TYPE
U.T.O.	=	UNABLE TO OBTAIN DATA
U.V.	=	UNKNOWN VALVE
W.V.	=	WATER VALVE
B.C.H.C.E.D.	=	BROWARD COUNTY HIGHWAY CONSTRUCTION AND ENGINEERING DEPARTMENT.

GENERAL NOTES-BROWARD COUNTY TRAFFIC ENGINEERING DEPT.

ALL PARTIES NOTE THE FOLLOWING:

1. DIRECTIONAL BORES, UTILITY CONNECTIONS, THE PLACEMENT OF MOT AND ADVANCE SIGNAGE MAY BY THEIR PLACEMENT, DAMAGE/DESTROY THE COMMUNICATIONS CABLE/CONDUIT LOCATED INSIDE AND OUTSIDE THE PROJECT AREA. ADDITIONALLY, CURB/GUTTER/SIDEWALK REMOVAL/PLACEMENT, RELOCATION OF TREES, LANDSCAPING ACTIVITIES AND IRRIGATION ACTIVITIES ARE POTENTIAL CAUSES FOR DAMAGE TO BCTED'S COMMUNICATION CABLE/CONDUIT. ALL PARTIES SHALL EXERCISE EXTREME CAUTION WHEN WORKING IN PROXIMITY TO THE COMMUNICATIONS CABLE/CONDUIT.
2. ANY ABOVE PROJECT ACTIVITY, INCIDENTAL OR OTHERWISE, WHICH IMPACTS OR DAMAGES THE COMMUNICATIONS CABLE/CONDUIT, SHALL BE SUBJECT TO THE FOLLOWING NOTES AND CONDITIONS BELOW:

(Revised: 10/13/2015)

"Communications Notes"

The agency responsible for maintenance of the traffic signals and related equipment is Broward County Traffic Engineering Division (BCTED). All system communications equipment, cabling and related material shall comply with Broward County's latest edition of the minimum standards as expressed in the "Standards and Specifications - Communication Infrastructure" document. Please refer to (BCTED's) Communications Policies and Procedures for additional information. Broward County Traffic Engineering Division will not accept any projects that do not meet these standards and specificatons. If fiber optic pull boxes already exist at an intersection, no additional fiber optic pull boxes will need to be installed. For a copy of these standards refer to the Broward County web site at www.BROWARD.ORG/TRAFFIC under publications.

If there are Copper Interconnect Cable/s within your project limits or within 1500 feet of your project limits, contact the Communications Manager at tecommunications@broward.org or 954-847-2745.

If there are Fiber Optic Cable/s within your project limits or within 1500 feet of your project limits contact the Communications Manager at tecommunications@broward.org or 954-847-2745.

If there are cellular communications within your project limits, contact the Communications Manager at tecommunications@broward.org or 954-847-2745

All BCTED communications cables/conduit shall be located a minimum of 48 hours in advance.

Browrd County Traffic Engineering Division
Procedure for Notification of Communication Disruption

Copper Interconnect Cable Notification Contact Person
When communications to an intersection must be disrupted by a Contractor to perform work, the Contractor shall provide two day advance notice in writing to the Broward County Traffic Engineering Division. This notification shall be conveyed via electronic mail (email) to the Traffic Signal Technician II at tecommunications@broward.org. Notification shall include contact person, telephone number, purpose, location and duration. The disruption shall last for no more than 3 consecutive business days. Where possible, the disruption shall be during off peak hours beginning at 9:00am and ending at 3:00pm.

Fiber Optic Cable Notification Contac Person
When communications to an intersection must be disrupted by a Contractor to perform work, the Contractor shall provide two day advance notice in writing to the Broward County Traffic Engineering Division. This notification shall be conveyed via electronic mail (email) to the Communications Manager at tecommunications@broward.org. Notification shall include contact person, telephone number, purpose, location and duration. The disruption shall last for no more than 3 consecutive business days. Where possible, the disruption shall be during off peak hours beginning at 9:00am and ending at 3:30pm.

Include the following in any notice of utility ownership or within a "Utility Owners/Contact Person" table:

Interconnect Communications Cables - (Robert Blount) Broward County Traffic Engineering Division (BCTED) 954-847-2745

DRAINAGE NOTES

1. DRAINAGE PIPE SHALL BE HIGH DENSITY POLYETHYLENE (HDPE) OR REINFORCED CONCRETE (RCP), THE USE OF RCP PIPE FOR PUBLIC ROADWAY CROSSINGS IS PREFERRED.
2. CATCH BASINS, INLETS AND JUNCTION BOXES SHALL NOT BE INSTALLED IN DRIVEWAYS.
3. PRIOR TO BACKFILLING EXFILTRATION TRENCHES, DRAINAGE INLETS OR MANHOLES, THE CONTRACTOR SHALL NOTIFY THE ENGINEERING INSPECTOR FOR AN INSPECTION.
4. DRAINAGE STRUCTURES SHALL BE CLEANED PRIOR TO ACCEPTANCE BY CITY OR DEPARTMENT OF ENVIRONMENTAL PROTECTION (DPEP).
5. ALL PIPES SHALL BE LAID IN DRY TRENCH. ALL MUCK OR UNSUITABLE MATERIALS IN TRENCHES, INLETS OR MANHOLES SHALL BE REMOVED AND BACKFILLED WITH SELECTED MATERIAL APPROVED BY THE ENGINEER.
6. MINIMUM COVER FOR HDPE PIPE UNDER ASPHALT SHALL BE 24" COMPACTED LIMEROCK BASE. MINIMUM COVER FOR PIPE UNDER GRASS SHALL BE 18" COMPACTED SUBGRADE.
7. THE CONTRACTOR SHALL MAINTAIN EXISTING DRAINAGE PATTERNS AND PREVENT ADVERSE FLOODING OF THE TRAVEL LANES DURING CONSTRUCTION.
8. MAINTENANCE ACCESS SHALL BE PROVIDED ON BOTH SIDES OF EXFILTRATION TRENCHES IN THE FORM OF MANHOLES OR CATCH BASINS. THE MAXIMUM DISTANCE BETWEEN STORM STRUCTURES SHALL NOT EXCEED TREE HUNDRED (300) FEET).
9. ALL EXFILTRATION SYSTEMS SHALL BE DESIGNED IN ACCORDANCE WITH SOUTH FLORIDA WATER MANAGEMENT DISTRICT'S (SFWMD) PERMIT INFORMATION MANUAL "MANAGEMENT AND STORAGE OF SURFACE WATER", LATEST EDITION.
10. GEOTEXTILIE MATERIALS USED IN THE CONSTRUCTION OF EXFILTRATION TRENCHES SHALL BE IN ACCORDANCE WITH THE CRITERIA OF FDOT "ROADWAY AND TRAFFIC DESIGN STANDARDS" LATEST EDITION AND CITY OF FORT LAUDERDALE'S SPECIFICATIONS.

BROWARD COUNTY FLORIDA

Our Best BROWARD COUNTY Nothing Less.

PUBLIC WORKS DEPARTMENT
TRAFFIC ENGINEERING DIVISION
2300 W. Commercial Boulevard • *Fort Lauderdale, Florida* 33309 • 954-847-2600 • FAX 954-847-2700

MAINTENANCE OF TRAFFIC - SCHOOL/PEDESTRIAN

The Maintenance of Traffic plan, provided by the Contractor, shall include provisions for pedestrian and/or school student traffic as well as vehicular traffic. The following are minimum requirements:

1. The safe walk route for all school students within the vicinity of the construction zone shall be maintained during student arrival and dismissal times. If the current walking surface cannot be maintained, then a temporary walkable surface shall be created. The safe walk route shall be separated from the construction activity during the entire length of the project encompassing the entire walk route with proper pedestrian openings at designated crossings in compliance with FDOT Design Standards Index No. 600 as well as meeting al ADA requirements.
2. All construction equipment activity around any designated crosswalk shall cease to operate during the student arrival and dismissal times. All construction equipment activity adjacent to a designated walk route shall cease operating unless satisfactorily barricaded from the walk route.
3. In the case that a designatec crossing or any portion of the designated walk route cannot be maintained, the Contractor shall notify the Special Projects Coordinator at Broward County Traffic Engineering Division, (954) 847-2600, a minimum of ten (10) working days prior to closing that route in order to establish an alternate crossing/route.
4. It shall be the Contractor's responsibility to install any necessary pavement, road rock, pavement markings and signage and/or any pedestrian signalization and/or signal modification to accommodate an existing or alternate walk route throughout the entire length of the project.
5. It shall be the Contractor's responsibility to provide State Certified School Crossing Guards or Off Duty Police Officers to cross students at all locations other than those previously designated. The Contractor may use Flagmen, but **ONLY** if they are State Certified as a School Crossing Guard.
6. Thirty (30) days prior to the beginning of construction the Contractor shall notify the Special Projects Coordinator at Broward County Traffic Engineering Division, (954) 847-2600 or at broward@traffic.org to discuss all necessary safety measures.
7. It shall be the Contractor's responsibility to notify the following Broward County School Board Pupil Transportation Department personnel if construction will impact any bus routes:

• Ruth Masters	Routing	(754) 321-4400 Ext. # 2309	ruth.masters@browardschools.com
• Vincent Harrell	Student Transportation & Fleet Service	(754) 321-4472	vincent.harrell@browardschools.com
• Mary Tochtermann	Student Transportation & Fleet Service	(754) 321-4400 Ext. # 2006	mary.tochtermann@browardschools.com

Upon coordination with the aforementioned personnel, and if deemed necessary, a pre-construction meeting will be helc to determine all bus routes and to make any necessary arrangements for rerouting. The Special Projects Coordinator from the Broward County Traffic Engineering Division, (954) 847-2600, will be notified and may attend the pre-construction meeting.

8. The Contractor shall be responsible for obtaining an approved Maintenance of Traffic Plan (MOT), specifying the above school/pedestrian conditions, through the Broward County Traffic Engineering Division or the Local Municipality, depending on the roadway jurisdiction. The conditions outlined in the MOT are fully effective as part of the proposed improvements. The Contractor shall be responsible for ensuring that all work associated with the project is in compliance with all the requirements of the approved MOT.
9. The Contractor shall ensure that there are **NO** speed limit signs installed within the designated reduced speed school zone at any time throughout the project.

Revised: 9/24/14

LEGEND:

SYMBOL	DESCRIPTION
M	WATER METER BOX
V	EXISTING VALVE
	PROPOSED VALVE
	FIRE HYDRANT
	BENCH MARK
	TREE
NBC	NAIL IN BOTTLE CAP
NIA	NAIL IN ASPHALT
---------	EDGE OF PAVEMENT
——-——-	RIGHT OF WAY
-·-·-·-	PARCEL LINE
—G—	EXISTING GAS LINE
—W—	EXISTING WATER MAIN
—BT—	EXISTING BURIED TELEPHONE
—T—	EXISTING TELEPHONE
—UE—	EXISTING UNDERGROUND ELECTRIC
—FM—	EXISTING FORCE MAIN
—OH—	EXISTING OVERHEAD WIRES
—CATV—	EXISTING CABLE TELEVISION
—X—X—	EXISTING CHAIN LINK FENCE
═══	EXISTING WOOD FENCE
#.##	EXISTING ELEVATION
SOIL BORE	SOIL BORING LOCATION MARK
	SOIL TYPE SEPARATION MARK
NEW 4" D.I.P. CLASS 350 FORCE MAIN	PROPOSED FORCE MAIN
	PUMP STATION
MH-#	MANHOLE NUMBER
MH-C#	CONFLICT MANHOLE NUMBER
XXXX @ S.S. 8" PVC @ X.XX	PROPOSED SANITARY SEWER
	SAN. SEWER LATERAL (DOUBLE)
	SAN. SEWER LATERAL (SINGLE)

NOTE: THIS LEGEND IS INTENDED FOR MOST SANITARY SEWER AND STORM SEWER PROJECTS, HOWEVER, THERE ARE PROJECTS USING ADDITIONAL SYMBOLS. THESE SYMBOLS WILL BE LOCATED ON OTHER SHEETS.

ARCHITECT: IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828-6891
FAX: (954) 828-5074

DRAWN BY: BH | DATE: Oct. 17, 16
DESIGNED BY: AR | SCALE: AS SHOWN
CHECKED BY: IR
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	DESCRIPTION
1	03-11	RC.	CHK'D J.P. UPDATE NOTE #22

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
LEGEND, ABBREVIATIONS & STANDARD NOTES
528 NW 2ND STREET

BID SET

SHEET NO. G01 OF 01
TOTAL: 02
CAD FILE: 12200-MULTI-NOTE
DRAWING FILE NO. 4-140-05

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GENERAL DEMOLITION SPECIFICATIONS:

1. THE LOCATIONS, ELEVATIONS AND DIMENSIONS OF ALL EXISTING UTILITIES SHOWN ON THIS PLAN HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THEIR ACCURACY. PRIOR TO THE START OF ANY DEMOLITION ACTIVITY, THE CONTRACTOR SHALL VERIFY THE LOCATION, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES AND OTHER FEATURES AFFECTING THE WORK PRIOR TO DEMOLITION. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES WHICH MAY EFFECT THE DEMOLITION WORK.
2. CHAPTER 553.851 OF THE FLORIDA STATUTES REQUIRES THAT AN EXCAVATOR NOTIFY ALL UTILITIES A MINIMUM OF TWO (2) WORKING DAYS PRIOR TO EXCAVATING.
3. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, LABOR, SUPERVISION, AND EQUIPMENT REQUIRED FOR THE ORDERLY DEMOLITION AND REMOVAL OF EXISTING STRUCTURES, PAVEMENT AND UTILITIES AS SHOWN ON THE DRAWINGS AND DESCRIBED HEREIN.
4. THE CONTRACTOR IS REQUIRED TO FAMILIARIZE HIMSELF WITH THE STRUCTURES TO BE DEMOLISHED.
5. THE FOLLOWING LIST OF STRUCTURES REQUIRING DEMOLITION IS INCLUDED FOR THE CONTRACTOR'S CONVENIENCE ONLY. THE DRAWINGS INDICATE THE SCOPE OF DEMOLITION WHERE DEMOLITION IS REQUIRED.
   - 5.1. DEMOLITION AND REMOVAL OF A 5' MIN.± STRIP OF EXISTING ON-SITE ASPHALT, CONCRETE AND CURBING AROUND THE PERIMETER OF THE EXISTING STRUCTURES AND UTILITIES BEING DEMOLISHED.
   - 5.2. REMOVAL OF EXISTING ON-SITE ABOVEGROUND AND UNDERGROUND UTILITIES, INCLUDING REMOVAL OR PLUGGING OF EXISTING UTILITIES AS SHOWN ON PLANS.
6. PRIOR TO REMOVAL OF ANY UNDERGROUND TANK AND OTHER COMPONENT, CONTRACTOR MUST COMPLETELY DRAIN THE SYSTEMS TO AN APPROVED SANITATION TANK FOR DISPOSAL TO AN APPROVED LOCATION, AS REQUIRED BY DISPOSAL PERMIT.
7. PROTECT AND SAVE ALL UTILITIES, UNLESS OTHERWISE NOTED.
8. ALL THE CONCRETE AND PAVEMENT TO BE REMOVED MUST BE SAW CUT CLEAN PRIOR TO REMOVAL
9. WET DOWN MASONRY WALLS AND DEBRIS DURING DEMOLITION AND LOADING OPERATIONS TO PREVENT THE SPREAD OF DUST (AS APPLICABLE TO PROJECT).
10. ALL EXISTING STRUCTURES, PAVEMENTS, SLABS, FOUNDATIONS, STEPS AND OTHER ON-SITE EXISTING FEATURES INDICATED ON THE DRAWINGS TO BE REMOVED SHALL BE DEMOLISHED AND REMOVED BY THE CONTRACTOR (AS APPLICABLE TO PROJECT).
11. ALL EXISTING SEWERS, PIPING AND UTILITIES SHOWN ARE NOT TO BE INTERPRETED AT THE EXACT LOCATION, OR AS THE ONLY OBSTACLES THAT MAY OCCUR ON THE SITE. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS AND PROCEED WITH CAUTION AROUND ANY ANTICIPATED FEATURES. GIVE NOTICE TO ALL UTILITY COMPANIES REGARDING DESTRUCTION AND REMOVAL OF ALL SERVICE LINES AND CAP ALL LINES BEFORE PROCEEDING WITH THE WORK.
12. THE CONTRACTOR SHALL COORDINATE WITH THE APPROPRIATE UTILITY COMPANY PRIOR TO REMOVAL OR RELOCATION OF ANY ELECTRICAL, TELEPHONE, CABLE AND/OR GAS LINES. SUFFICIENT TIME SHALL BE PROVIDED FOR RELOCATION AND CLOSE COORDINATION WITH THE UTILITY COMPANY TO PROVIDE A SMOOTH TRANSITION IN UTILITY SERVICE.
13. CONTRACTOR MUST STOP OPERATION AND NOTIFY THE OWNER/ENGINEER FOR PROPER DIRECTION IF ANY ENVIRONMENTAL OR HEALTH RELATED CONTAMINANT IS ENCOUNTERED DURING THE DEMOLITION/EXCAVATION PROCESS.
14. FILL FOR LOWER LEVELS OF DEMOLISHED STRUCTURES MAY INCLUDE CONCRETE OR MASONRY RUBBLE RESULTING FROM DEMOLITION, SUBJECT TO THE ENGINEER'S/ARCHITECT'S APPROVAL. RUBBLE SHALL NOT EXCEED SIX (6) INCHES IN LONGEST DIMENSION.
15. REMOVE AND LEGALLY DISPOSE OF ALL OTHER RUBBISH, RUBBLE, AND DEBRIS. COMPLY WITH ALL APPLICABLE LAWS AND REGULATIONS GOVERNING DISPOSAL OF WASTES AND DEBRIS.
16. CONTINUOUS ACCESS AND OPERATION SHALL BE MAINTAINED FOR THE SURROUNDING PROPERTIES AND BUILDINGS AT ALL TIMES DURING DEMOLITION OF THE EXISTING COMPOST FACILITY.
17. PRIOR TO DEMOLITION OCCURRING ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.
18. ALL SIGNS OUTSIDE THE DEMOLITION AREA ARE TO REMAIN UNLESS OTHERWISE SPECIFIED.
19. ANY MUCK ENCOUNTERED UNDER PROPOSED STRUCTURES SHALL BE REMOVED TO 5 FT. BEYOND THE FOOTPRINT OF THAT STRUCTURE. BACKFILL WITH APPROVED FILL MATERIAL SATISFYING ALL COMPACTION REQUIREMENTS.
20. ALL EXISTING UTILITIES WITHIN THE DEMOLITION SITE AREA SHALL BE ADJUSTED, REMOVED OR RELOCATED AT THE CONTRACTOR'S EXPENSE. ACTUAL WORK SHALL BE COORDINATED BY THE CONTRACTOR DIRECTLY W/ THE APPROPRIATE UTILITY COMPANY. ALL EXPENSES SHALL BE INCLUDED IN THE CONTRACTOR'S BID.
21. THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES BEFORE EXCAVATION.
22. ALL TRASH, DEBRIS AND OTHER MATERIAL REMOVED FROM THE SITE SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

PRE-DEMOLITION RESPONSIBILITIES

1. UPON RECEIPT OF NOTICE OF AWARD, THE CONTRACTOR SHALL ARRANGE A PRE-DEMOLITION CONFERENCE TO INCLUDE ALL INVOLVED GOVERNMENTAL AGENCIES, ALL AFFECTED UTILITY OWNERS, THE OWNER, THE ENGINEER AND THE CONTRACTOR.
2. PRIOR TO DEMOLITION, THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT A DEMOLITION SCHEDULE DEPICTING EACH PHASE OF THE WORK.
3. PRIOR TO DEMOLITION, CONTRACTOR TO PROVIDE FOR THE OWNER A LISTING OF THE FACILITIES THE CONTRACTOR WILL UTILIZE FOR RECYCLING AND DISPOSAL OF SPECIFIC MATERIALS. CONTRACTOR TO SPECIFY THE MATERIALS INTENDED FOR RECYCLING AND THE MATERIALS INTENDED FOR DISPOSAL FOR OWNER'S APPROVAL.
4. PRIOR TO DEMOLITION CONTRACTOR TO PROVIDE THE OWNER SKETCHES SHOWING PROPOSED HAULING ROUTES TO RECYCLING AND DISPOSAL FACILITIES FOR APPROVAL.
5. PRIOR TO BEGINNING DEMOLITION, THE CONTRACTOR SHALL VERIFY THE SIZE, LOCATION, ELEVATION, AND MATERIAL OF ALL EXISTING UTILITIES WITHIN THE AREA OF DEMOLITION.
6. EXISTING UTILITY LOCATIONS SHOWN ON THESE PLANS ARE APPROXIMATE. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF EXISTING UTILITIES SHOWN OR FOR ANY EXISTING UTILITIES NOT SHOWN.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO ANY EXISTING UTILITIES FOR WHICH IT FAILS TO REQUEST LOCATIONS FROM THE UTILITY OWNER. THE CONTRACTOR IS RESPONSIBLE AS WELL FOR DAMAGE TO ANY EXISTING UTILITIES WHICH ARE PROPERLY LOCATED.
8. THE LOCATIONS OF EXISTING UTILITIES AND STORM DRAINAGE SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. ENGINEER ASSUMES NO RESPONSIBILITY FOR INACCURACY. PRIOR TO THE START OF ANY DEMOLITION ACTIVITY, IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO MAKE ARRANGEMENTS FOR THE FIELD LOCATIONS AND FOR ANY RELOCATION'S OF THE VARIOUS EXISTING UTILITIES WITH THE UTILITY
   OWNERS, WHICH SHALL BE DONE IN A TIMELY MANNER TO MINIMIZE IMPACT ON DEMOLITION SCHEDULE. ANY DELAY CAUSED BY THE CONTRACTOR BY THE RELOCATION OF UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.
9. SUNSHINE STATE ONE CALL OF FLORIDA, INC. REQUIRES THE CONTRACTOR TO CALL TWO (2) FULL BUSINESS DAYS (BUT NOT MORE THAN FIVE) PRIOR TO BREAKING GROUND TO FIND OUT WHERE BURIED FACILITIES (ELECTRICAL, GAS, TELEPHONE, CABLE, WATER) ARE LOCATED.

DEMOLITION SAFETY

1. ALL DEMOLITION SHALL BE DONE IN A SAFE MANNER, SPECIFICALLY, THE RULES AND REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), THE FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) AND THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) SHALL BE STRICTLY OBSERVED.
2. PROVIDE ADEQUATE PROTECTION FOR PERSONS AND PROPERTY AT ALL TIMES. EXECUTE THE WORK IN A MANNER TO AVOID HAZARDS TO PERSONS AND PROPERTY AND PREVENT INTERFERENCE WITH THE USE OF AND ACCESS TO ADJACENT BUILDINGS. STREETS AND SIDEWALKS SHALL NOT BE UNNECESSARILY BLOCKED BY DEBRIS AND EQUIPMENT.
3. BUILDING MATERIALS SHALL BE TESTED FOR ASBESTOS.
4. IF PETROLEUM PRODUCTS ARE FOUND WHILE DEMOLISHING, PETROLEUM WASTE SHOULD BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

PAVEMENT DEMOLITION

1. WHERE EXISTING PAVEMENT IS TO BE REMOVED, SAW-CUT THE SURFACING LEAVING A UNIFORM AND STRAIGHT EDGE WITH MINIMUM DISTURBANCE TO THE REMAINING ADJACENT SURFACING. IF DEMOLITION RESULTS IN RAVELING OF SAW CUT SURFACE , RECUT BACK FROM THE RAVELED EDGE PRIOR TO RESTORATION.
2. WHERE EXISTING PAVEMENT, CURB, CURB AND GUTTER, SIDEWALK, DRIVEWAY, OR VALLEY GUTTER IS REMOVED FOR INLETS, MANHOLES, APPURTENANCES, FACILITIES OR STRUCTURES, SAID PAVEMENT, ETC., SHALL BE REPLACED AND RESTORED IN EQUAL OR BETTER CONDITION THAN THE ORIGINAL. CONTRACTOR SHALL PROVIDE ALL NECESSARY LABOR, MATERIALS, EQUIPMENT, TOOLS, SUPPLIES, AND OTHER EQUIPMENT AS REQUIRED.
3. CONTRACTOR MAY LIMIT SAW-CUT AND PAVEMENT REMOVAL TO ONLY THOSE AREAS WHERE IT IS REQUIRED AS SHOWN ON THIS PLAN; HOWEVER, IF ANY DAMAGE IS INCURRED ON ANY OF THE SURROUNDING PAVEMENT, SIDEWALK, BUILDINGS, UTILITIES, ETC., THEN THE CONTRACTOR SHALL BE RESPONSIBLE FOR IT'S REMOVAL AND REPAIR TO EQUAL OR BETTER QUALITY.

DEMOLITION PERMITTING

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ANY REQUIRED PERMITS FOR DEMOLITION FROM RESPONSIBLE REGULATORY AGENCIES WHILE FULLY ACKNOWLEDGING AND COMPLYING WITH ALL REQUIREMENTS PRIOR TO COMMENCING DEMOLITION WORK.
2. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE THE EXTENT OF DEMOLITION, RECYCLING OR REUSE REQUIRED IN ORDER TO PERFORM THE CONTRACT WORK FOR THIS PROJECT. THE CONTRACTOR SHALL CONDUCT SITE VISITS AND SHALL EXAMINE ALL OF THE INFORMATION WITHIN THESE DOCUMENTS: ALL DISCREPANCIES AND/OR OMISSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO BID SUBMITTAL.
3. THE CONTRACTOR SHALL COORDINATE WITH OWNER PRIOR TO COMMENCEMENT OF ANY WORK. ACTUAL REMOVAL AND/OR RELOCATION OF ALL EXISTING LANDSCAPING WITHIN DEMOLITION AREAS TO BE CONDUCTED BY A LANDSCAPE CONTRACTOR. IT IS THE RESPONSIBILITY OF THE SITEWORK DEMOLITION CONTRACTOR TO COORDINATE DEMOLITION ACTIVITIES WITH THE LANDSCAPE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING AND PRESERVING TREES AS INDICATED ON THE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TREE REMOVAL PERMIT OR ANY OTHER APPLICABLE PERMIT TO REMOVE, RELOCATE, OR PRESERVE EXISTING LANDSCAPE & TREES.
4. ANY TREES FOR REMOVAL FOUND TO BE GREATER THAN OR EQUAL TO THREE (3) INCHES IN DIAMETER AT BREAST HEIGHT (DBH) WILL REQUIRE A PERMIT WITH THE BROWARD COUNTY ENVIRONMENTAL PROTECTION AND GROWTH MANAGEMENT DEPARTMENT (BCEPGMD).
5. SHOULD REMOVAL AND/OR RELOCATION ACTIVITIES DAMAGE THE LIGHTING, STORM INLET STRUCTURES, OR OTHER STRUCTURES DESIGNATED TO BE SAVED, THEN THE CONTRACTOR SHALL PROVIDE NEW MATERIALS/STRUCTURES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

DEMOLITION EROSION AND SEDIMENT CONTROL NOTES:

1. THE SCHEDULING, SEQUENCING AND CONTROL MEASURES, WHICH ARE OUTLINED HEREIN, ARE SUBJECT TO THE FINAL DEFINITION BY THE CONTRACTOR WHO WILL BE SELECTED TO PERFORM THE WORK AND WILL BE RESPONSIBLE FOR IMPLEMENTATION AND COMPLIANCE.
2. PRIOR TO DEMOLITION, THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT A DEMOLITION SCHEDULE DEPICTING EACH PHASE OF THE WORK. THE CONTRACTOR SHALL ALSO BE REQUIRED TO SUBMIT AN EROSION AND SEDIMENT CONTROL PLAN ENCOMPASSING THE PRINCIPALS AND THE REQUIREMENTS DESCRIBED HEREIN AND A SCHEDULE FOR THEIR IMPLEMENTATION AND MAINTENANCE FOR THE PROJECT DURATION.
3. DURING DEMOLITION, THE CONTRACTOR SHALL TAKE ALL REASONABLE MEASURES TO ENSURE AGAINST POLLUTING, SILTATION OR DISTURBANCE TO SUCH AN EXTENT AS TO CAUSE AN INCREASE IN TURBIDITY TO THE EXISTING DRAINAGE SYSTEMS AND ADJACENT WATER BODIES AND WETLANDS, IN COMPLIANCE WITH ALL PERMIT REQUIREMENTS RELATED TO SUCH MEASURES.
4. METHODS MAY INCLUDE DEMOLITION OF TEMPORARY CONTROL STRUCTURES SUCH AS SEDIMENT BASINS, SEDIMENT CHECKS, SILT BARRIERS, SILT SCREENS, TURBIDITY BARRIERS OR THE BEST MANAGEMENT PRACTICES AVAILABLE TO THE INDUSTRY.
5. EROSION AND SEDIMENT CONTROL INSTALLATIONS SHALL BE MAINTAINED THROUGHOUT THE DEMOLITION PERIOD AND UNTIL NEW VEGETATIVE GROWTH HAS BEEN ESTABLISHED.
6. THROUGHOUT THE DEMOLITION PERIOD, THE CONTRACTOR SHALL INSPECT DAILY THE PROTECTIVE INSTALLATIONS FOR FAILURE OR SIGNS OF FAILURE OR MALFUNCTION AND EFFECT REPAIRS OR REPLACEMENT IMMEDIATELY UPON DISCOVERY.
7. INLETS AND CATCH BASINS, EXISTING ON-SITE AND OFF-SITE, SHALL BE PROTECTED FROM SEDIMENT STORM RUNOFF.
8. THE CONTRACTOR SHALL PROMPTLY REMOVE ALL MUD, DIRT OR OTHER MATERIALS TRACKED OR SPILLED ONTO EXISTING PUBLIC ROADS AND FACILITIES DUE TO DEMOLITION.
9. DEWATERING ACTIVITIES WILL NOT RESULT IN ANY DISCHARGE OF TURBID WATER FROM THE PROJECT SITE WITHOUT PROPER EROSION AND SEDIMENT CONTROL AND APPROVAL FROM ENGINEER.
10. PHASING OF EROSION CONTROL DEMOLITION SHALL BE RECOMMENDED AS FOLLOWS:
    - 10.1. PLACEMENT OF PERIMETER PROTECTIVE MEASURES (SILT FENCE, HAY BALES, TURBIDITY BARRIERS, ETC.) AROUND ON-SITE FEATURES TO BE RETAINED, AT POINTS OF OFF-SITE DISCHARGE AND AROUND WORK AREAS TO BE EXCAVATED OR FILLED.
    - 10.2. REROUTE RUNOFF FROM AREAS OUTSIDE OF THE DEMOLITION AREA TO MINIMIZE FLOW THROUGH AREAS TO BE DISTURBED BY DEMOLITION. BERMS, SWALES AND OTHER MEANS USED FOR SUCH CONVEYANCE SHALL BE VEGETATED AND MEASURES TAKEN TO PROVIDE PROTECTION UNTIL STABILIZATION OCCURS (AS APPLICABLE TO THE PROJECT).
    - 10.3. SELECT LOCATIONS FOR PLACEMENT OF EXCAVATED MATERIAL, WHERE SUITABLE FOR FILL OR UNSUITABLE MATERIAL, AND CONSTRUCT CONTAINMENT BERMS AROUND THE AREA. THE USE OF STRIPING FOR THIS PURPOSE MAY ACCELERATE BERM REVEGETATION. CONSTRUCT TEMPORARY OUTLETS FOR CONTAINMENT AREAS WITH SCREENS, HAY BALES, SETTLING BASINS OR OTHER MEASURES TO PREVENT SILT TRANSPORT.
    - 10.4. SELECT / DESIGNATE ACCESS ROUTING FOR DEMOLITION EQUIPMENT AND VEHICLES AND PROVIDE PERIMETER PROTECTIVE MEASURES WHERE EXISTING TERRAIN WILL BE SUBJECT TO DISRUPTION BY SUCH TRAFFIC.
    - 10.5. CONSTRUCT ABOVE GROUND OR OTHER CONTAINMENT AREAS FOR DEMOLITION AREA RUNOFF. PROVIDE SCREENS, HAY BALES, ETC. TO FILTER DISCHARGE FROM THOSE AREAS.
    - 10.6. SPOIL MOUNDS SHALL NOT BE LEFT FOR MORE THAN ONE WEEK PRIOR TO REPLACEMENT UNLESS PROTECTIVE CONTAINMENT MEASURES IN THE WORK AREA ARE APPLIED.
    - 10.7. GRASSING, SODDING, ETC. SHALL BE IN PLACE IMMEDIATELY UPON COMPLETION OF REGRADING, SWALE SLOPES AND THE CONSTRUCTED OR DISTURBED AREAS.
11. THE CONTRACTOR IS REQUIRED TO ADHERE TO THE REQUIREMENT OF THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES). THE CONTRACTOR SHALL INSTITUTE BEST MANAGEMENT PRACTICES (BMPs) TO ENSURE COMPLIANCE WITH THE NPDES PROGRAM AND TO MINIMIZE THE IMPACT TO PUBLIC STORMWATER FACILITIES. A NOTICE OF INTENT (NOI) SHALL BE FILED PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.
12. PRIOR TO CONSTRUCTION, A SILT FENCE IN ACCORDANCE WITH CITY'S DETAIL SILT FENCE SHALL BE ERECTED AS NOTED ON PLANS. ALL PROPOSED CATCH BASINS WILL HAVE THEIR INLETS PROTECTED BY THE INSTALLATION OF FILTER FABRIC INTO THE FRAME AND GRATE. THIS SILT FENCE AND FILTER FABRIC WILL REMAIN IN PLACE DURING THE ENTIRE DURATION OF CONSTRUCTION.
13. CONTRACTOR WILL BRACE ALL EXISTING LANDSCAPING TO REMAIN PRIOR TO BEGINNING ANY WORK AND WILL ENSURE THEIR STABILIZATION THROUGHOUT THE ENTIRE CONSTRUCTION PROCESS. EXISTING SOD DISTURBED BY CONSTRUCTION THAT IS NOT AFFECTED BY PROPOSED GRADING WILL BE RESTORED TO ITS ORIGINAL STATE UPON COMPLETION OF CONSTRUCTION. SODDED SLOPES STEEPER THAN 4 HORIZONTAL TO 1 VERTICAL WILL BE PEGGED.
14. ALL WASTE GENERATED FROM THE CONSTRUCTION SHALL BE DISCARDED IN ACCORDANCE WITH ALL APPLICABLE STATE, LOCAL AND FEDERAL REGULATIONS. CONTRACTOR IS TO OBTAIN ALL APPLICABLE CODES AND BECOME FAMILIAR WITH STATE, LOCAL AND FEDERAL REGULATIONS PRIOR TO BEGINNING CONSTRUCTION. REGULATIONS CAN BE FOUND, BUT NOT LIMITED TO, DEPARTMENT OF ENVIRONMENTAL RESOURCE MANAGEMENT AND DEPARTMENT OF ENVIRONMENTAL PROTECTION.
15. TO ENSURE THAT OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST IS MINIMIZED, CONTRACTOR IS TO PUT INTO PRACTICE THE METHODS DETAILED IN FDOT INDEX 106 (LATEST VERSION) AND BMPs.
16. DUST GENERATED FROM CONSTRUCTION WILL BE MINIMIZED BY DAILY WATERING OF THE SITE.
17. AT ANY TIME DURING CONSTRUCTION THAT THE SILT FENCING IS DISTURBED, THE SILT FENCING SHALL BE RESTORED TO ITS ORIGINAL STATE WITHIN 24 HOURS. AT NO TIME DURING CONSTRUCTION SHALL WORK BE PERFORMED WITHOUT THE INTEGRITY OF THE SILT FENCING SECURED.
18. A QUALIFIED INSPECTOR, PROVIDED BY THE OPERATOR, SHALL INSPECT ALL POINTS OF DISCHARGE INTO NEARBY SURFACE WATER OF THE STATE AND SFWMD. THE INSPECTION WILL OCCUR AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS OF THE END OF A STORM THAT IS 0.5 INCHES OR GREATER. INSPECTION INCLUDES THE WRITTEN RECORDING OF THE CONDITION OF ALL DISCHARGE POINTS, INTEGRITY OF SILT FENCING, DAILY DUST CONTROL MEASURES, VEHICULAR TRAFFIC AND CONSTRUCTION MATERIAL STORAGE AND DISPOSAL. WRITTEN RECORD OF ALL INSPECTIONS WILL BE STORED BY THE OPERATOR DURING CONSTRUCTION.

DEMOLITION EROSION AND SEDIMENT CONTROL NOTES (CONT'D):

19. THE INSPECTION REPORT WILL INCLUDE, BUT IS NOT LIMITED TO, THE FOLLOWING INFORMATION: NAME AND QUALIFICATION OF PERSONNEL MAKING THE INSPECTION, DATE OF INSPECTION, RAINFALL DATE, MAJOR OBSERVATIONS RELATING TO THE SWPPP, ACTIONS TAKEN BY CONTRACTOR AND ANY INCIDENT OF NONCOMPLIANCE WITH PERMIT. WHERE AN INSPECTION DOES NOT IDENTIFY ANY INCIDENT OF NONCOMPLIANCE, THE REPORT SHALL CONTAIN A CERTIFICATION THAT THE FACILITY IS IN COMPLIANCE WITH THE SWPPP AND THE PERMIT.
20. THE PERMITTEE SHALL RETAIN A COPY OF THE SWPPP AND ALL REPORTS, RECORDS AND DOCUMENTATION REQUIRED BY THE PERMIT AT THE CONSTRUCTION SITE, OR AN APPROPRIATE ALTERNATIVE LOCATION AS SPECIFIED IN THE NOTICE OF INTENT, FROM THE DATE OF PROJECT INITIATION TO THE DATE OF FINAL STABILIZATION. THE PERMITEE SHALL RETAIN COPIES OF SWPPP AND ALL REPORTS REQUIRED BY THIS PERMIT, AND RECORDS OF ALL DATA USED TO COMPLETE THE NOTICE OF INTENT TO BE COVERED BY THE PERMIT, FOR A PERIOD OF AT LEAST THREE (3) YEARS FROM THE DATE THAT THE SITE IS FINALLY STABILIZED.
21. SEE LANDSCAPE PLANS FOR TREE REMOVAL AND LANDSCAPE DEMOLITION.
22. CONTRACTOR SHALL COORDINATE THROUGH CONSTRUCTION DIVISION AND CITY OF FORT LAUDERDALE PARKS DEPARTMENT ON HOW TO STOCK AND RE-USE EXCAVATED SOIL FROM SITE (AS APPLICABLE TO THE PROJECT).

INTERRUPTION OF EXISTING UTILITIES

1. ANY DEMOLITION WORK THAT REQUIRES INTERRUPTION OF SERVICE TO ANY CUSTOMER SHALL BE DONE SO WITH A MINIMUM OF SEVENTY-TWO (72) HOUR NOTICE TO, AND WRITTEN APPROVAL BY, THE APPROPRIATE UTILITY COMPANY. THE CONTRACTOR SHALL ARRANGE A MEETING WITH THE LOCAL JURISDICTIONAL AGENCIES AND OTHER GOVERNING AGENCIES, AND OTHER AFFECTED UTILITIES PRIOR TO SCHEDULING THE SHUT DOWN TO ASSESS THE SCOPE OF WORK. ALL SYSTEM SHUT DOWNS SHALL BE SCHEDULED BY THE
   CONTRACTOR AT SUCH TIME THAT SYSTEM DEMAND IS LOW. THIS GENERALLY REQUIRES NIGHT TIME WORK BY THE CONTRACTOR AND REQUIRES FULL TIME INSPECTION BY A REPRESENTATIVE OF THE UTILITY. ALL COST FOR OVERTIME WORK BY THE REPRESENTATIVE OF THE UTILITY SHALL BE BORNE BY THE CONTRACTOR. EACH CUSTOMER AFFECTED BY THE SHUT DOWN SHALL BE PROVIDED, MINIMUM,
   FORTY-EIGHT (48) HOURS WRITTEN NOTIFICATION BY THE CONTRACTOR.

TEMPORARY DEMOLITION FACILITIES

1. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ARRANGE OR SUPPLY TEMPORARY WATER SERVICE, SANITARY FACILITIES AND ELECTRICITY TO ITS EMPLOYEES AND SUBCONTRACTORS FOR THEIR USE DURING DEMOLITION.
2. MAINTENANCE OF TRAFFIC (MOT) IN THE PUBLIC RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE MUTCD AND FDOT.
3. ALL OPEN TRENCHES AND HOLES ADJACENT TO ROADWAYS OR WALKWAYS SHALL BE PROPERLY MARKED AND BARRICADED TO ASSURE THE SAFETY OF BOTH VEHICULAR AND PEDESTRIAN TRAFFIC.
4. NO TRENCHES OR HOLES NEAR WALKWAYS OR IN ROADWAYS OR THEIR SHOULDERS ARE TO BE LEFT OPEN DURING NIGHTTIME HOURS WITHOUT EXPRESS WRITTEN PERMISSION OF THE CITY OR RESPECTIVE GOVERNING AGENCY.

WASTE MANAGEMENT PLAN

1. IMPLEMENT A WASTE MANAGEMENT PLAN FOR APPROVED BY THE OWNER. PROVIDE HANDLING, CONTAINERS, STORAGE, SIGNAGE, TRANSPORTATION AND OTHER ITEMS AS NEEDED TO IMPLEMENT THE WASTE MANAGEMENT PLAN DURING THE ENTIRE DURATION OF THE CONTRACT.
2. DESIGNATE A WASTE MANAGEMENT COORDINATOR TO BE RESPONSIBLE FOR IMPLEMENTING, MONITORING AND REPORTING STATUS OF WASTE MANAGEMENT WORK PLAN. COORDINATOR SHALL BE PRESENT AT PROJECT SITE FULL TIME FOR DURATION OF PROJECT.
3. TRAIN WORKERS, SUBCONTRACTORS AND SUPPLIERS ON PROPER WASTE MANAGEMENT PROCEDURES, AS APPROPRIATE FOR THE WORK OCCURING AT THE PROJECT SITE.
4. DISTRIBUTE A WASTE MANAGEMENT PLAN BEFORE WORK BEGINS. REVIEW PLAN PROCEDURES AND LOCATION ESTABLISHED FOR SALVAGE, RECYCLING AND DISPOSAL.

RECYCLING DEMOLITION WASTE

1. SEPARATE RECYCLABLE WASTE FROM OTHER WASTE MATERIALS, TRASH AND DEBRIS. SEPARATE RECYCLABLE WASTE BY TYPE AT THE PROJECT SITE TO THE MAXIMUM EXTENT PRACTICAL.
2. PROVIDE APPROPRIATELY MARKED CONTAINERS OR BINS FOR CONTROLLING RECYCLABLE WASTE UNTIL THEY ARE REMOVED FROM THE PROJECT SITE. INCLUDE A LIST OF ACCEPTABLE AND UNACCEPTABLE MATERIALS AT EACH CONTAINER AND BIN.
   - 2.1. INSPECT CONTAINERS AND BINS FOR CONTAMINATION AND REMOVE CONTAMINATED MATERIALS IF FOUND.
3. STOCKPILE PROCESSED MATERIALS ON-SITE WITHOUT INTERMIXING WITH OTHER MATERIALS. PLACE, GRADE AND SHAPE STOCKPILES
   TO DRAIN SURFACE WATER. COVER TO PREVENT WINDBLOWN DUST.
4. STOCKPILE MATERIALS AWAY FROM DEMOLITION AREA. DO NOT STORE WITHIN DRIP LINE OF REMAINING TREES.
5. STORE COMPONENTS OFF THE GROUND AND PROTECT FROM THE WEATHER.
6. REMOVE RECYCLABLE WASTE OFF THE OWNER'S PROPERTY AND TRANSPORT TO RECYCLING RECEIVER OR PROCESSOR.
7. ASPHALTIC CONCRETE PAVING: BREAK UP AND TRANSPORT PAVING TO ASPHALT RECYCLING FACILITY.
8. CONCRETE: REMOVE REINFORCEMENT AND OTHER METALS FROM CONCRETE AND SORT WITH OTHER METALS.
9. MASONRY: MASONRY WASTE SHALL INCLUDE WHOLE OR BROKEN BRICK AND CONCRETE MASONRY UNITS. WHOLE MASONRY UNITS SHALL BE CLEANED AND REUSED OR DONATED. BROKEN MASONRY SHALL BE CRUSHED AND USED AS FILL FOR OFFSITE AREAS. REMOVE METAL REINFORCEMENT, ANCHORS AND TIES FROM MASONRY AND SORT WITH OTHER METALS.
10. METALS: METALS FROM REINFORCED CONCRETE, REINFORCED MASONRY, STRUCTURAL STEEL MEMBERS, FLASHING AND SHEET METAL, CONDUIT PIPE, SIDING, PIPING AND WIRING SHALL BE SEPARATED BY TYPE.
    - 10.1. STRUCTURAL STEEL: STACK MEMBERS ACCORDING TO THEIR SIZE, TYPE AND LENGTH.
    - 10.2. REMOVE BOLTS, NUTS, WASHERS AND OTHER ROUGH HARDWARE.
11. SITE-CLEARING WASTE SHALL BE RECYCLED BY CHIPPING BRUSH, BRANCHES AND TREES, THEN HAUL TO NEAREST WOOD RECYCLING CENTER.

DISPOSAL OF WASTE

1. GENERAL: EXCEPT FOR ITEMS OR MATERIALS TO BE SALVAGED, RECYCLED OR OTHERWISE REUSED, REMOVE WASTE MATERIALS FROM PROJECT SITE AND LEGALLY DISPOSE OF THEM IN A LANDFILL OR OTHER PERMITTED DISPOSAL FACILITY.
   - 1.1. EXCEPT AS OTHERWISE SPECIFIED, DO NOT ALLOW WASTE MATERIALS THAT ARE TO BE DISPOSED OF TO ACCUMULATE ON-SITE.
   - 1.2. REMOVE AND TRANSPORT DEBRIS IN A MANNER THAT WILL PREVENT SPILLAGE ON ADJACENT SURFACES AND AREAS.
2. BURNING: DO NOT BURN WASTE MATERIALS.
3. DISPOSAL: TRANSPORT WASTE MATERIALS OFF THE OWNER'S PROPERTY AND LEGALLY DISPOSE OF THEM.

ABBREVIATIONS LEGEND

INV. = PIPE INVERT ELEVATION
E.O.P. = EDGE OF PAVEMENT
NGVD = NATIONAL GEODETIC VERTICAL DATUM
NAVD = NORTH AMERICAN VERTICAL DATUM

ARCHITECT:
IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828-6891
FAX: (954) 828-5074

DRAWN BY: BH
DATE: Oct. 24, 16
DESIGNED BY: AR
SCALE: AS SHOWN
CHECKED BY: IR
FIELD BOOK:

REVISIONS

NO.	DATE	BY	CH'D	DESCRIPTION

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
DEMOLITION NOTES
528 NW 2ND STREET

BID SET

SHEET NO. G02 OF 02
TOTAL: 02
CAD FILE: 12200-MULTI-NOTE
DRAWING FILE NO. 4-140-05

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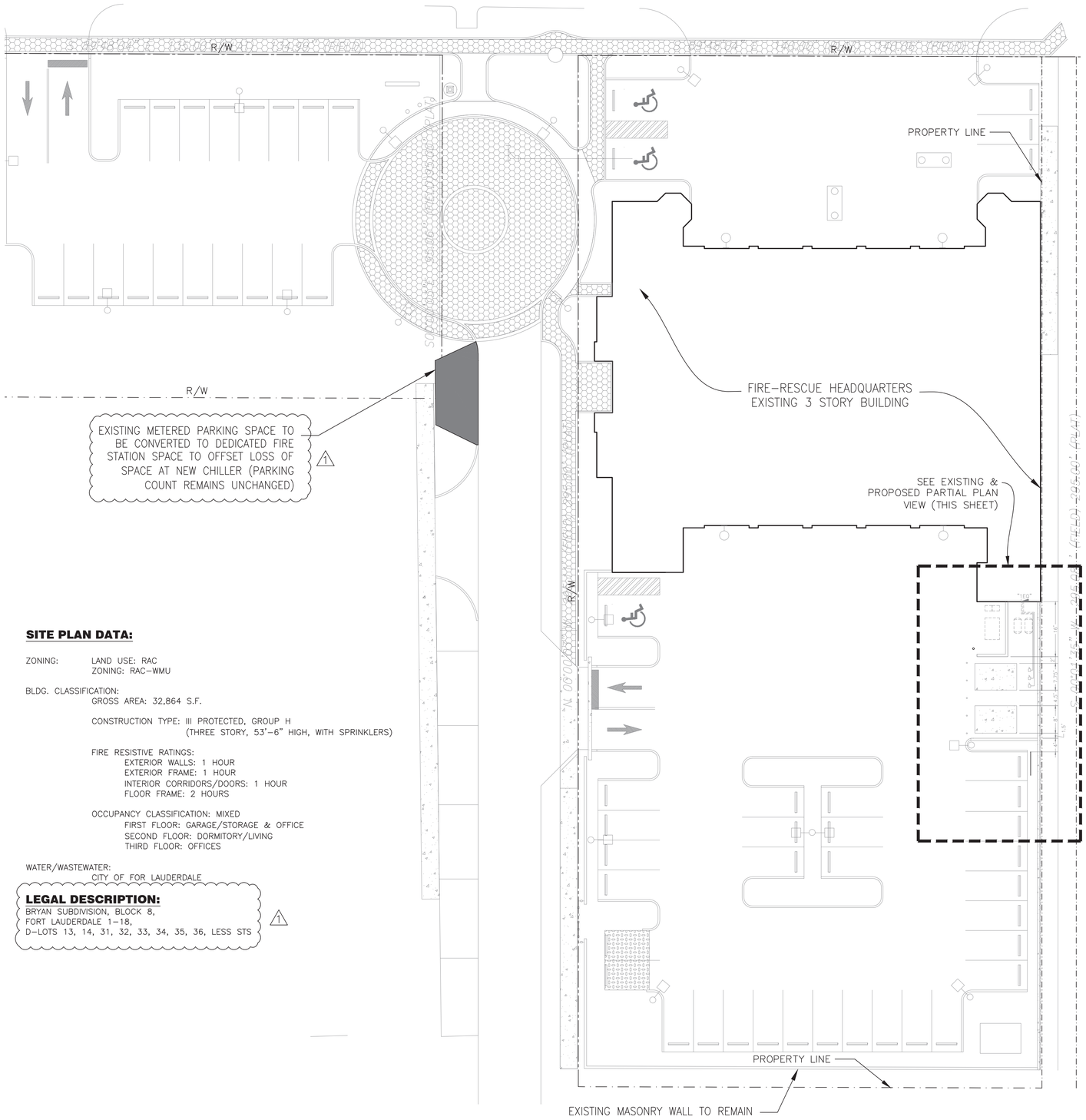


FIRE STATION 2 SITE PLAN

Scale: 1/16"-1"- 0"

SITE PLAN DATA:

ZONING: LAND USE: RAC
ZONING: RAC–WMU

BLDG. CLASSIFICATION:
GROSS AREA: 32,864 S.F.

CONSTRUCTION TYPE: III PROTECTED, GROUP H
(THREE STORY, 53'–6" HIGH, WITH SPRINKLERS)

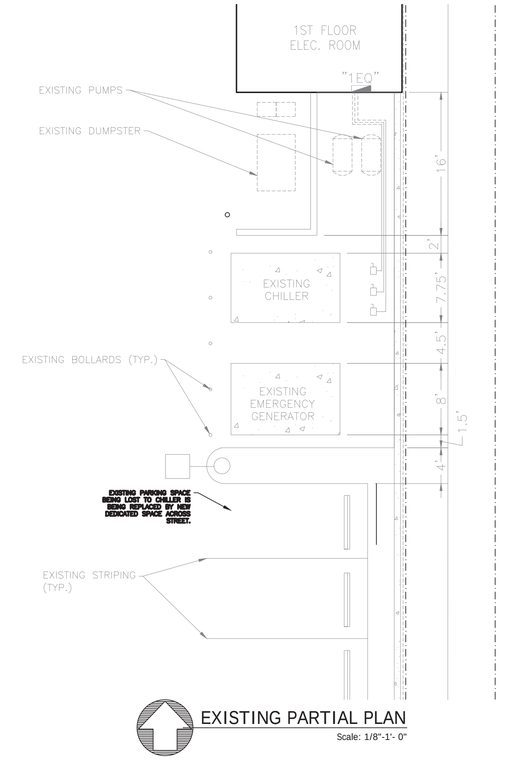
FIRE RESISTIVE RATINGS:
EXTERIOR WALLS: 1 HOUR
EXTERIOR FRAME: 1 HOUR
INTERIOR CORRIDORS/DOORS: 1 HOUR
FLOOR FRAME: 2 HOURS

OCCUPANCY CLASSIFICATION: MIXED
FIRST FLOOR: GARAGE/STORAGE & OFFICE
SECOND FLOOR: DORMITORY/LIVING
THIRD FLOOR: OFFICES

WATER/WASTEWATER:
CITY OF FOR LAUDERDALE

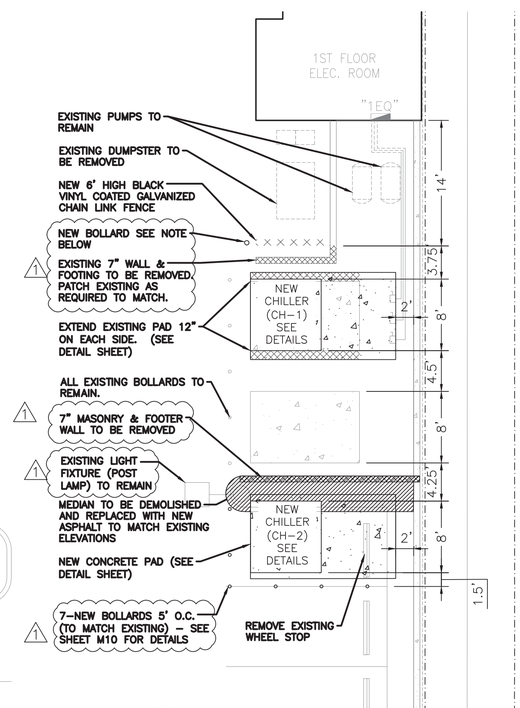
LEGAL DESCRIPTION:
BRYAN SUBDIVISION, BLOCK 8,
FORT LAUDERDALE 1–18,
D–LOTS 13, 14, 31, 32, 33, 34, 35, 36, LESS STS

1



EXISTING PARTIAL PLAN

Scale: 1/8"-1"- 0"



PROPOSED PARTIAL PLAN

Scale: 1/8"-1"- 0"

ARCHITECT:
IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828–6081
FAX: (954) 828–5974

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Dec. 16, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION
1	1/18/17	AR	IT	BLDG. DEPT. COMMENTS

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ARCHITECTURAL SITE PLAN
528 NW 2ND STREET

BID SET

SHEET NO. A01 OF 05

TOTAL: 05

CAD FILE: 12200–MULTI–ARCH

DRAWING FILE NO. 4–140–05

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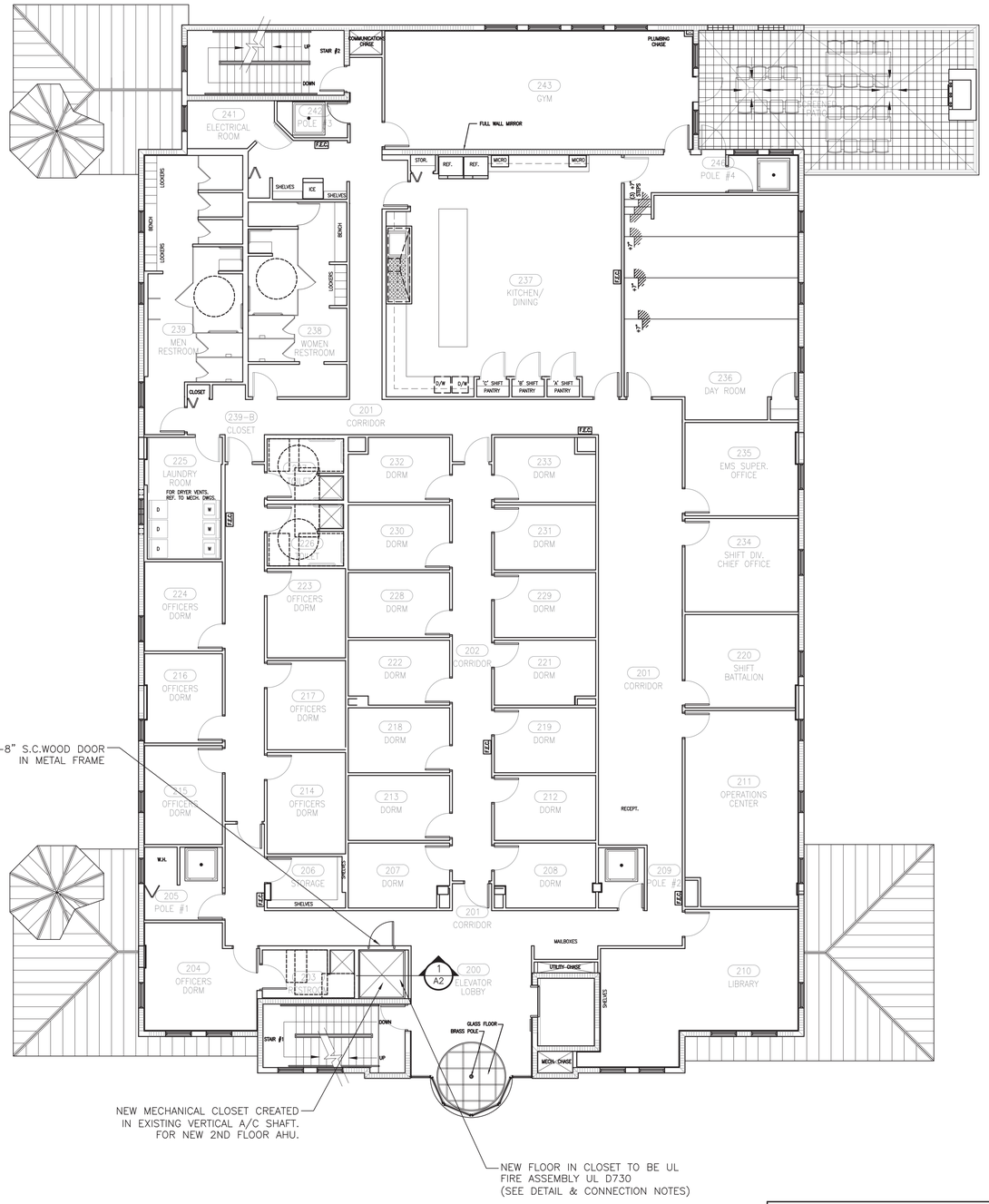
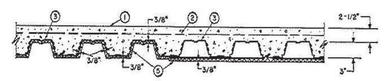


EXISTING SECOND FLOOR PLAN

SCALE:1/8"=1'-0"

Unrestrained Assembly Ratings — 1-1/2 and 2 Hr. (See Item 3)



DESIGN NO. D730

AUGUST 13, 2015
RESTRAINED ASSEMBLY RATING — 2 HR.

UNRESTRAINED ASSEMBLY RATINGS — 1–1/2 AND 2 HR. (SEE ITEM 3)

THIS DESIGN WAS EVALUATED USING A LOAD DESIGN METHOD OTHER THAN THE LIMIT STATES DESIGN METHOD (E.G., WORKING STRESS DESIGN METHOD). FOR JURISDICTIONS EMPLOYING THE LIMIT STATES DESIGN METHOD, SUCH AS CANADA, A LOAD RESTRICTION FACTOR SHALL BE USED — SEE GUIDE BXUV OR BXUV7

*INDICATES SUCH PRODUCTS SHALL BEAR THE UL OR CUL CERTIFICATION MARK FOR JURISDICTIONS EMPLOYING THE UL OR CUL CERTIFICATION (SUCH AS CANADA), RESPECTIVELY.

①NORMAL–WEIGHT CONCRETE — CARBONATE OR SILICEOUS AGGREGATE, 150 (+ OR –) 3 PCF UNIT WEIGHT, 4000 PSI COMPRESSIVE STRENGTH.

②WELDED WIRE FABRIC — 6 BY 6 IN. NO. 10/10 SWG.

③STEEL FLOOR AND FORM UNITS* — COMPOSITE, 2 OR 3 IN. DEEP GALV UNITS. MIN GAUGES ARE 22 MSG FOR FLUTED UNITS AND 20/20 MSG FOR CELLULAR UNITS.
WHEN THE UNITS ARE FLUTED OR ALTERNATING ONE 24 OR 36 IN. WIDE CELLULAR TO ONE OR MORE 24 OR 36 IN. WIDE FLUTED, THE RATINGS ARE:

RESTRAINED ASSEMBLY2 HR
UNRESTRAINED ASSEMBLY2 HR
WHEN THE UNITS ARE ALL CELLULAR, THE RATINGS ARE:

RESTRAINED ASSEMBLY2 HR
UNRESTRAINED ASSEMBLY1–1/2 HR
CANAM STEEL CORP — 36 IN. WIDE TYPE P–3623 AND 24 IN WIDE TYPE P–2432 COMPOSITE.

CANAM STEEL CORP — 24 IN. WIDE TYPES LF2, LF3, LFC2, LFC3; 24 IN. WIDE, TYPES NL, NLC. TYPES LF2, LF3, NL UNITS MAY BE PHOS/PTD.

NEW MILLENNIUM BUILDING SYSTEMS L L C — 24 IN. WIDE TYPES CFD–1.5, –2 OR –3.

DESIGN ASSISTANCE CONSTRUCTION SYSTEMS INC — 24 IN. WIDE TYPE DACS2.0CD, OR DACS3.0CD.

EPIC METALS CORP — 24 IN. WIDE TYPES EC300, EC366, ECP300, ECP366; 36 IN. WIDE TYPES EC266, ECP266. WELDED TO SUPPORTS AT 12 IN. OC FOR 266 AND 366 SERIES UNITS, AND ALTERNATING 8 AND 16 IN. OC FOR 300 SERIES UNITS. ADJACENT UNITS, BUTTON–PUNCHED OR WELDED TOGETHER 36 IN. OC ALONG SIDE JOINTS.

H H ROBERTSON — QL TYPES, 24 IN. WIDE, 3 IN. 99, WKX; 36 IN. WIDE, 3 IN. 99, WKX. WELDED TO SUPPORTS 12 IN. OC. ADJACENT UNITS PLUG–WELDED ALONG SIDE JOINTS 60 IN. OC.

MARLYN STEEL DECKS INC — TYPE 2.0 CF OR 3.0 CF.

MORIN CORP — 36 IN. WIDE, TYPE LXR–2W.

NEW MILLENNIUM BUILDING SYSTEMS L L C — TYPE 1.5CD, 2.0CD, OR 3.0CD. UNITS MAY BE PHOS/PAINTED OR GALVANIZED.

VULCRAFT, DIV OF NUCOR CORP — 24 OR 36 IN. WIDE TYPES 2VLI, 2.0PLVLI, 2VLP, 2.0PLVLP, 3VLI, 3.0PLVLI, 3VLP, 3.0PLVLP. TYPES 2VLI, 2.0PLVLI, 3VLI, 3.0PLVLI UNITS MAY BE PHOS/PTD. 24 OR 36 IN. WIDE TYPES 2.0 SB, 3.0 SB.

ALTERNATE CONSTRUCTION — NONCOMPOSITE UNITS OF THE SAME TYPE LISTED ABOVE MAY BE USED, PROVIDED ALLOWABLE LOADING IS CALCULATED ON THE BASIS OF NONCOMPOSITE DESIGN.

④JOINT COVER — (NOT ILLUSTRATED). 2 IN. WIDE PRESSURE–SENSITIVE ADHESIVE CLOTH TAPE.

⑤SPRAY–APPLIED FIRE RESISTIVE MATERIALS* — APPLIED BY MIXING WITH WATER AND SPRAYING ONE COAT TO A FINAL THICKNESS AS SHOWN ABOVE, TO STEEL SURFACES WHICH MUST BE CLEAN AND FREE OF DIRT, LOOSE SCALE AND OIL. MIN AVG AND MIN IND DENSITY OF 15/14 PCF RESPECTIVELY. MIN AVG AND MIN IND DENSITY OF 19/18 PCF RESPECTIVELY FOR TYPE 7GP AND 7HD. FOR METHOD OF DENSITY DETERMINATION, REFER TO DESIGN INFORMATION SECTION. TYPES 4, 5GP, 7GP, 7HD, 8GP, 9GP. VP4 MAY BE USED ONLY WITH ALL FLUTED STEEL FLOOR UNITS OR BLENDS CONSISTING OF ONE OR MORE FLUTED UNITS TO ONE 24 IN. WIDE MAX CELLULAR UNIT, 1–1/2, OR 3 IN. DEEP, WITH CELLS SPACED APPROX 6 AND 8 IN. RESPECTIVELY.
USE OF SPATTER COAT TYPES DK, DK2, DK3. SK–1 OR SK–III IS REQUIRED ON ALL CELLULAR UNITS WITH FLAT PLATE ON THE BOTTOM, OPTIONAL ON OTHER STEEL SURFACES. THICKNESS OF THE SPATTER COAT IS INCLUDED IN THE TOTAL FINAL THICKNESS OF THE PROTECTION MATERIAL.

GCP KOREA INC — TYPES MK–6/CBF, MK–6/ED, MK–6/HY, MK–6S, MONOKOTE ACOUSTIC 1, SK–III.

PYROK INC — TYPE LD.

SOUTHWEST FIREPROOFING PRODUCTS CO — TYPES 4, 5, 5EF, 5GP, 5MD, 7GP, 7HD, 8EF, 8GP, 8MD, 9EF, 9GP, 9MD, DK, DK2, DK3.

GCP APPLIED TECHNOLOGIES INC — TYPES MK–6/HY, MK–6S, MONOKOTE ACOUSTIC 1, RG, SK–III.

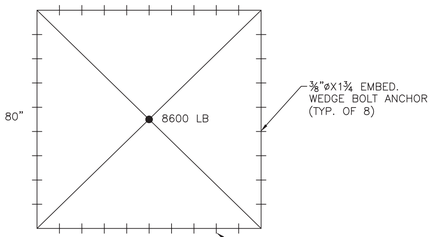
⑥METAL LATH — (NOT SHOWN) — WHERE TYPE 7HD IS APPLIED TO STEEL DECK, 3/8 IN. METAL RIBBED LATH WEIGHING 3.4 LB/YD2 SHALL BE SECURED TO THE UNDERSIDE OF THE STEEL DECK (RIBS UPWARD) WITH S–12 BY 3/8 IN. LONG PAN HEAD, SELF–TAPPING STEEL SCREWS SPACED 12 IN. OC IN ALL DIRECTIONS. STEEL SCREWS SHALL BE FITTED WITH 1/2 IN. DIAMETER STEEL WASHERS. ADJACENT PIECES OF LATH SHALL BE OVERLAPPED 1 IN. MIN.
*INDICATES SUCH PRODUCTS SHALL BEAR THE UL OR CUL CERTIFICATION MARK FOR JURISDICTIONS EMPLOYING THE UL OR CUL CERTIFICATION (SUCH AS CANADA), RESPECTIVELY.

LAST UPDATED ON 2015–08–13
DESIGN/SYSTEM/CONSTRUCTION/ASSEMBLY USAGE DISCLAIMER
AUTHORITIES HAVING JURISDICTION SHOULD BE CONSULTED IN ALL CASES AS TO THE PARTICULAR REQUIREMENTS COVERING THE INSTALLATION AND USE OF UL CERTIFIED PRODUCTS, EQUIPMENT SYSTEM, DEVICES, AND MATERIALS.
AUTHORITIES HAVING JURISDICTION SHOULD BE CONSULTED BEFORE CONSTRUCTION.
FIRE RESISTANCE ASSEMBLIES AND PRODUCTS ARE DEVELOPED BY THE DESIGN SUBMITTER AND HAVE BEEN INVESTIGATED BY UL FOR COMPLIANCE WITH APPLICABLE REQUIREMENTS. THE PUBLISHED INFORMATION CANNOT ALWAYS ADDRESS EVERY CONSTRUCTION NUANCE ENCOUNTERED IN THE FIELD.
WHEN FIELD ISSUES ARISE, IT IS RECOMMENDED THE FIRST CONTACT FOR ASSISTANCE BE THE TECHNICAL SERVICE STAFF PROVIDED BY THE PRODUCT MANUFACTURER NOTED FOR THE DESIGN. USERS OF FIRE RESISTANCE ASSEMBLIES ARE ADVISED TO CONSULT THE GENERAL GUIDE INFORMATION FOR EACH PRODUCT CATEGORY AND EACH GROUP OF ASSEMBLIES. THE GUIDE INFORMATION INCLUDES SPECIFICS CONCERNING ALTERNATE MATERIALS AND ALTERNATE METHODS OF CONSTRUCTION.
ONLY PRODUCTS WHICH BEAR UL'S MARK ARE CONSIDERED CERTIFIED.

UNIT WEIGHT = 420LB
80X86/144 = 47.8 = 48FT.
L.L = 100X48 = 4800LB
D.L.

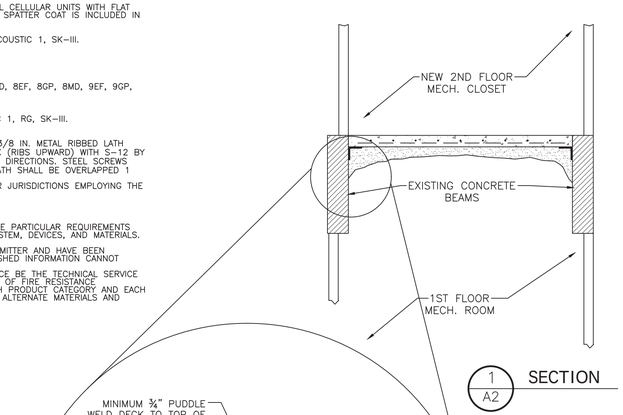
W = 5.5X48FT²/12X150LB/FT
W = 3300LB
TOTAL LOAD = 500+ 4800+ 3300 = 8600LB
LENGTHS = 2(86+80)/12 = 27.66
8600LB/27.66 = 311 LB/FT
SELECT ⅜"ø, 1¾ EMBEDMENT WEDGE BOLT CONCRETE ANCHOR

ALLOWABLE SHEER OF 389LB/FT & TENSION OF 669LB/FT
NO. OF ANCHORS = 2229/389 = 5.7 ANCHOR USE 9 ON 86" SIDE
NO. OF ANCHORS = 2073/389 = 5.3 ANCHOR USE 8 ON 80" SIDE

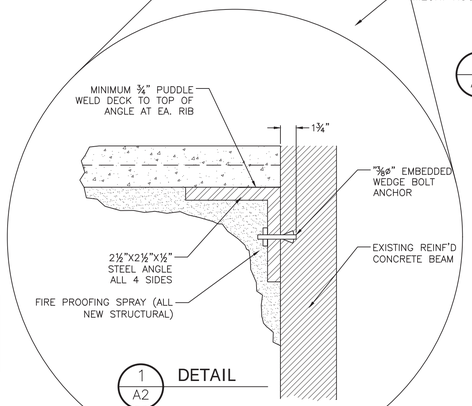


NEW FLOOR DETAIL

Scale: NTS



1 A2 SECTION



1 A2 DETAIL

DOOR SCHEDULE

MARK	SIZE			MATERIAL		FINISH		THRESH.	HARD WARE				REMARKS
	WIDTH	HEIGHT	THICK.	DOOR	FRAME	DOOR	FRAME						
①	3'–0"	6'–8"	1.75"	S.C. WOOD	STEEL	PAINT	PAINT	N/A	A				INSULATED, 20 MINUTES

HARDWARE SCHEDULE

ITEM	DESCRIPTION	A						REMARKS
LOCKSET	SCHLAGE – ND40S – HEAVY DUTY COMMERCIAL, BATH/BEDROOM PRIVACY LOCK WITH RHODES STYLE LEVERS	■						
HINGES	HAGAR – BB1199 – 4½" x 4½", FULL MORTISE, HEAVY WEIGHT, BALL BEARING, STAINLESS STEEL (3 PER DOOR), & 180° SWING.	■						
CLOSER	LCN – 4040XH/4041H – DELAYED ACTION, SUPER–SMOOTHE WITH CUSH–N–STOP AND HOLD–OPEN FEATURE. INTERIOR SURFACE MOUNTED	■						MATCH DOOR COLOR & FINISH EACH LEAF AT PAIR OF DOORS
DOOR STOPS	DOOR STOP 232W	■						EACH LEAF AT PAIR OF DOORS
THRESHOLD		■						

HARDWARE NOTES:

1. ALL HARDWARE SHALL HAVE A SATIN CHROMIUM PLATED FINISH (260) UNLESS OTHERWISE NOTED.
2. ALL EGRESS LOCKS TO COMPLY WITH NFPA 101 7.2.1.5.1..
3. PROVIDE IVES 407½ – 2½ DIAMETER, CONCAVE, LIGHT GRAY, RUBBER, WALL BUMPER WITH STAINLESS STEEL CASING AT ALL WALLS WHICH MAY BE DAMAGED BY ANY DOOR KNOB.

ARCHITECT:
IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828–6891
FAX: (954) 828–5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Dec. 16, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION
1	1/18/17	AR	IT	BLDG. DEPT. COMMENTS

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
EXISTING SECOND FLOOR PLAN
FLOOR PLAN
528 NW 2ND STREET

BID SET

SHEET NO. A02 OF 1 05
TOTAL 05

CAD FILE: 12200–MULTI–ARCH

DRAWING FILE NO. 4–140–05

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(3) EXISTING FIRE SPRINKLERS TO BE LOWERED TO NEW 8' CEILING. LICENSED FIRE SPRINKLER CONTRACTOR TO EXTEND EXISTING HEADS TO NEW CEILING & CERTIFY COMPLETE SYSTEM

EXISTING ACOUSTIC CEILING & (4) 2X2 LAMPS NORTHWARD OF EXISTING COLUMN IN CONFERENCE ROOM TO BE LOWERED TO 8' HEIGHT TO ACCOMMODATE NEW AIR HANDLER ABOVE CEILING. VERTICAL EDGE OF DROP CEILING TO BE OF SAME ACOUSTIC TILES TO MATCH. (TYPICAL)

EXISTING 9'-0" CEILING IN CONFERENCE ROOM TO REMAIN. CONTRACTOR TO EXERCISE CAUTION NOT TO DISTURB ANY EXISTING MEDIA TELE-COMMUNICATION OR CABLING IN CEILING AREA.

EXISTING THIRD FLOOR CEILING PLAN

SCALE:1/8"=1'-0"

ARCHITECT:
IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828-6691
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Dec. 16, 16
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PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
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PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
EXISTING THIRD FLOOR PLAN
FLOOR PLAN
528 NW 2ND STREET

BID SET

SHEET NO. A03 OF 05
TOTAL 05

CAD FILE: 12200-MULTI-ARCH
DRAWING FILE NO. 4-140-05

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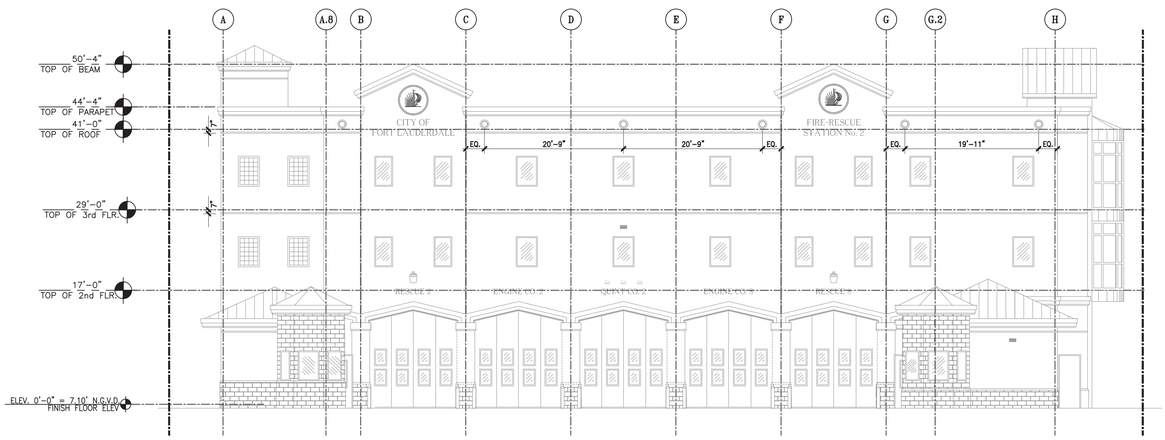
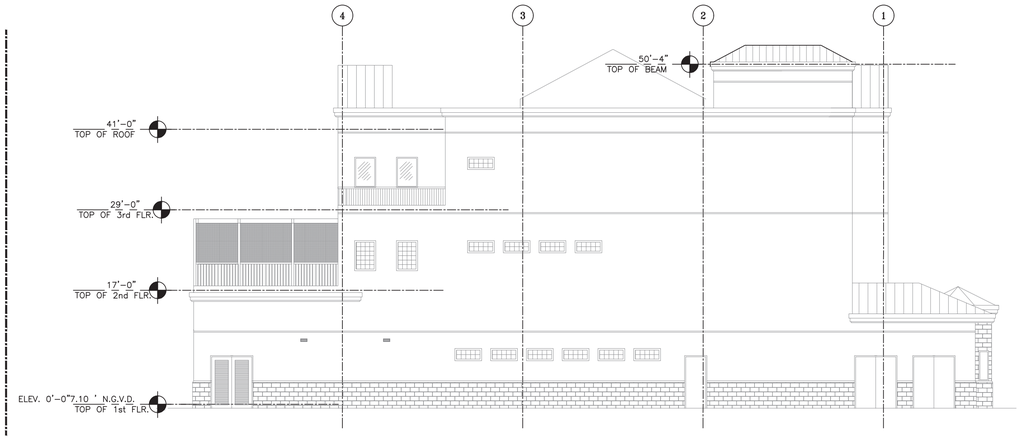


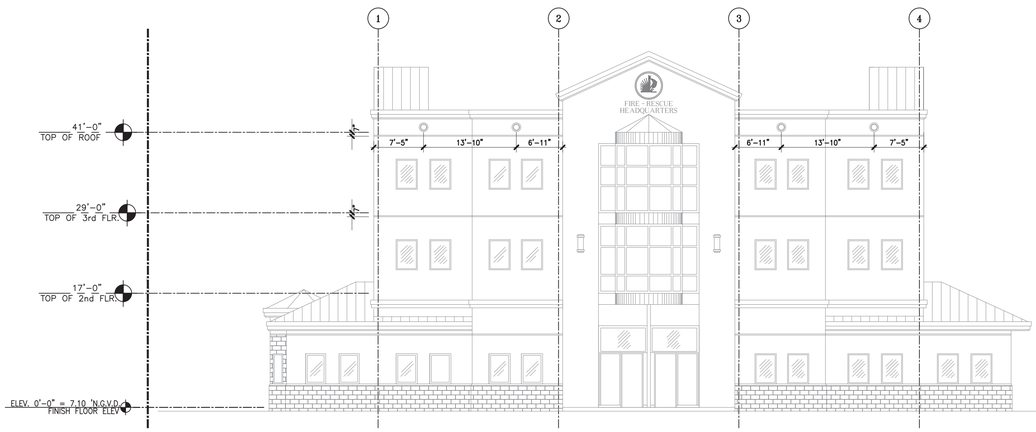
EXISTING NORTH ELEVATION

Scale: 3/32"-1'-0"



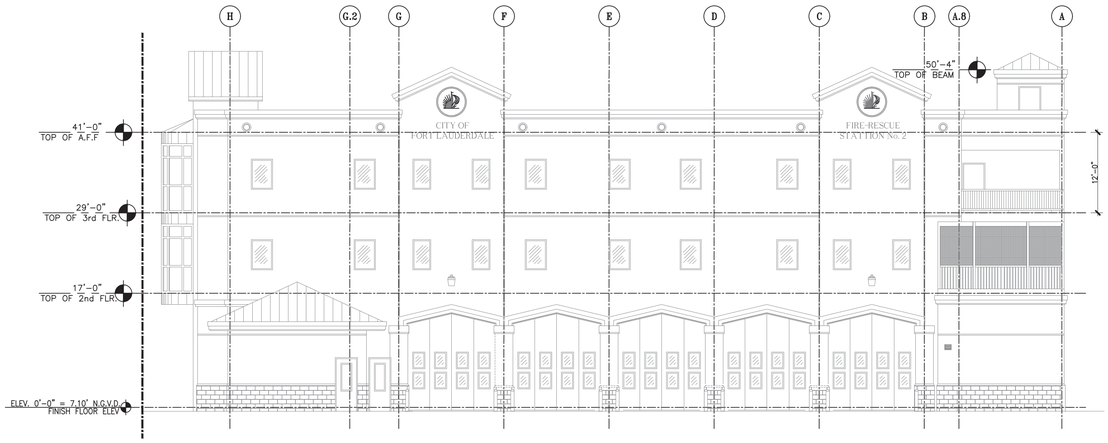
EXISTING EAST ELEVATION

Scale: 3/32"-1'-0"



EXISTING WEST ELEVATION

Scale: 3/32"-1'-0"



EXISTING SOUTH ELEVATION

Scale: 3/32"-1'-0"

NOTE:
EXTERIOR ELEVATIONS SHOWN
FOR REFERENCE ONLY.

BID SET

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IRINA TOKAR
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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS			
NO.	DATE	BY	CHK'D

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
BUILDING ELEVATIONS
528 NW 2ND STREET

SHEET NO.	OF
A04	05
TOTAL:	05
CAD FILE: 12200-MULTI-ARCH	
DRAWING FILE NO. 4-140-05	

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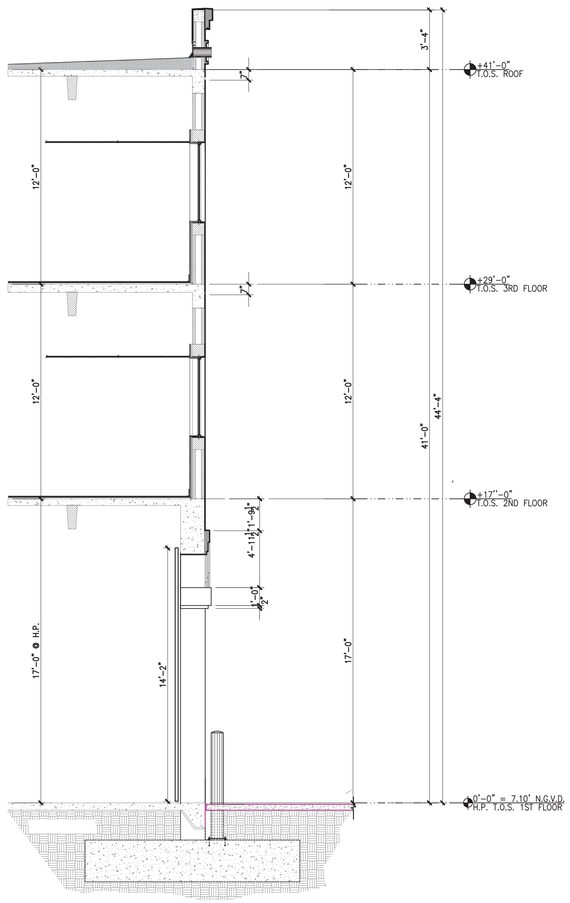
11/20/2017 9:24 AM

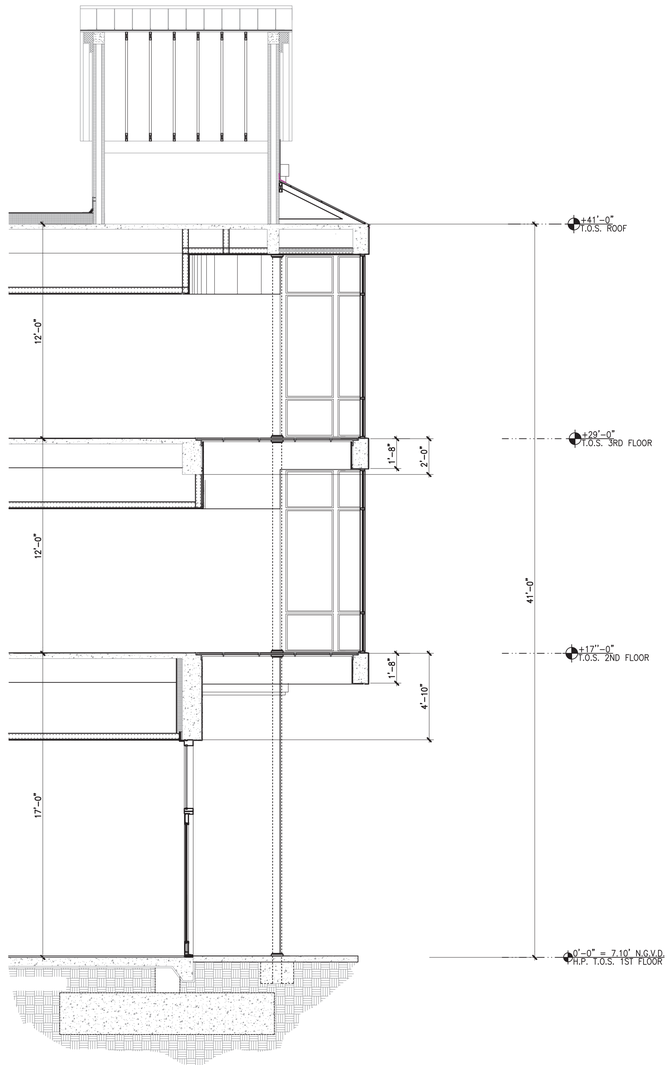
NOTE:

1. CONTRACTOR TO PATCH/ REPLACE ANY EXISTING CEILINGS ASSEMBLIES AS REQUIRED TO MATCH.
2. MOST OF THE NEW MECHANICAL WORK SHALL BE DONE VIA SUSPENDED TILE CEILINGS WITHOUT CUTTING INTO HARD DRY WALL CEILINGS.
3. ANY REPLACEMENT MATERIALS TO MEET THE FIRE RATINGS OF EXISTING MATERIALS.
4. FIRE RATING BETWEEN FIRST & SECOND FLOOR IS TWO HOURS; BETWEEN SECOND & THIRD FLOOR IS 1 HOUR.



TYPICAL- NORTH WALL SECTION

Scale: 1/4"-1'-0"



TYPICAL WEST WALL SECTION

Scale: 1/4"-1'-0"

NOTE:
WALL SECTIONS SHOWN FOR REFERENCE ONLY.

GENERAL NOTE:

1. BUILDING PERMITS ARE REQUIRED FROM ALL APPLICABLE JURISDICTIONS. CONTRACTOR SHALL APPLY FOR, RECEIVE & PAY FOR ALL APPLICABLE FEES FOR ALL BLDG. PERMITS, LICENSES, ETC. REQUIRED FOR THIS WORK, INCLUDING THOSE FROM THE CITY OF FORT LAUDERDALE. A COPY OF ALL PERMITS SHALL BE GIVEN TO THE CITY ARCHITECT AND CONSTRUCTION MANAGEMENT PRIOR TO DEMOLITION, CONSTRUCTION OR MOBILIZATION.
2. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO ANY FABRICATIONS. THIS INCLUDES IN–FIELD VERIFIED DIMENSIONS DURING CONSTRUCTION OF PROJECT.
3. IF ANY DISCREPANCIES ARE FOUND, THEY SHALL BE IMMEDIATELY REPORTED TO THE CITY ARCHITECT AND CONSTRUCTION MANAGEMENT. CONTRACTOR SHALL BE HELD FINANCIALLY RESPONSIBLE FOR FAILURE TO REPORT.
4. ALL WOOD IN CONTACT WITH CONCRETE, STEEL OR MASONRY SHALL BE PRESSURE TREATED.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING AND IMPLEMENTING A STORMWATER POLLUTION PREVENTION PLAN (SWPPP), INCLUDING BUT NOT LIMITED TO SILT FENCE, INLET PROTECTION, WATER MONITORING, ETC. A SILT FENCE AROUND THE ENTIRE PROJECT LIMITS AND FILTER FABRIC IN THE FRAME AND GRATE OF ALL EXISTING CATCH BASINS WITHIN 100' OF THE PROJECT AREA SHALL BE PROTECTED.

   ALL ELEVATIONS SHOWN ARE REFERENCED TO NGVD 1929 (SEE NOTE FOR C
6. CONTRACTOR SHALL ADJUST ALL EXISTING UTILITY RIMS/COVERS AND BRING THEM TO PROPOSED GRADES AS NECESSARY.
7. LOCATION OF ALL EXISTING UTILITIES, INCLUDING SERVICE CONNECTIONS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
8. CONTRACTOR SHALL KEEP ALL EXISTING UTILITY SERVICES ACTIVE THROUGHOUT ALL CONSTRUCTION ACTIVITIES AND SHALL PROVIDE TEMPORARY SERVICES AT NO ADDITIONAL COST TO CITY. THIS INCLUDES ANY REINFORCEMENT AND SUPPORT OF EXISTING OVERHEAD WIRES AND/OR EXISTING POLES DURING ALL CONSTRUCTION ACTIVITIES.
9. EXISTING TREES WITHIN THE PROJECT LIMITS SHALL BE PROTECTED WITH TEMPORARY BARRIER DURING CONSTRUCTION, PER DETAIL.
10. CHAPTER 553.851 OF THE FLORIDA STATUTES REQUIRES THAT AN EXCAVATOR NOTIFY ALL UTILITIES A MINIMUM OF TWO (2) WORKING DAYS PRIOR TO EXCAVATING.
11. PROTECT AND SAVE ALL UTILITIES, UNLESS OTHERWISE NOTED.
12. ALL CONCRETE AND PAVEMENT TO BE REMOVED MUST BE SAW CUT CLEAN AND WET PRIOR TO REMOVAL.
13. PRIOR TO DEMOLITION OCCURRING ALL EROSION CONTROL DEVICES ARE TO BE INSTALLED.
14. ALL TRASH, DEBRIS AND OTHER MATERIAL REMOVED FROM THE SITE SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
15. PRIOR TO BEGINNING DEMOLITION, THE CONTRACTOR SHALL VERIFY THE SIZE, LOCATION, ELEVATION, AND MATERIAL OF ALL OR EXISTING UTILITIES WITHIN THE AREA OF DEMOLITION.
16. EXISTING UTILITY LOCATIONS IF SHOWN ON THE PLANS ARE APPROXIMATE. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF EXISTING UTILITIES SHOWN OR FOR ANY EXISTING UTILITIES NOT SHOWN.
17. THE LOCATIONS OF EXISTING UTILITIES AND STORM DRAINAGE SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. ENGINEER ASSUMES NO RESPONSIBILITY FOR INACCURACY. PRIOR TO THE START OF ANY DEMOLITION ACTIVITY, IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO MAKE ARRANGEMENTS FOR THE FIELD LOCATIONS AND FOR ANY RELOCATION'S OF THE VARIOUS EXISTING UTILITIES WITH THE UTILITY OWNERS, WHICH SHALL BE DONE IN A TIMELY MANNER TO MINIMIZE IMPACT ON DEMOLITION SCHEDULE. ANY DELAY CAUSED BY THE CONTRACTOR BY THE RELOCATION OF UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.
18. ALL OPEN TRENCHES AND HOLES ADJACENT TO WALKWAYS SHALL BE PROPERLY MARKED AND BARRICADED TO ASSURE THE SAFETY OF PEDESTRIAN TRAFFIC.
19. NO TRENCHES OR HOLES NEAR WALKWAYS ARE TO BE LEFT OPEN DURING NIGHTTIME HOURS WITHOUT EXPRESS WRITTEN PERMISSION OF THE CITY OR RESPECTIVE GOVERNING AGENCY.

ARCHITECT:
IRINA TOKAR
REG. No: AR93424
DATE:

TEL: (954) 828-6891
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
FIELD BOOK:
DATE: Dec. 16, 16
SCALE: AS SHOWN

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
TYPICAL BUILDING SECTIONS
528 NW 2ND STREET

BID SET

SHEET NO. A05 OF 05

TOTAL: 05

CAD FILE: 12200–MULTI–ARCH

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ELECTRICAL SYMBOL LEGEND

- 2'X4' RECESSED MOUNTED FLUORESCENT LIGHT FIXTURE
- 2'X4' RECESSED MOUNTED FLUORESCENT EMERGENCY LIGHT FIXTURE (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- 2'X2' RECESSED MOUNTED FLUORESCENT LIGHT FIXTURE
- 2'X2' RECESSED MOUNTED FLUORESCENT EMERGENCY LIGHT FIXTURE (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- 1'X4' RECESSED OR SURFACE MOUNTED FLUORESCENT LIGHT FIXTURE.
- 1'X4' RECESSED OR SURFACE MOUNTED LIGHT FIXTURE. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- WALL MOUNTED FLUORESCENT LIGHT FIXTURE, 7'-4" A.F.F. (6" ABOVE DOOR FRAME OR MIRRORS), U.O.N.
- WALL MOUNTED FLUORESCENT EMERGENCY LIGHT FIXTURE, 7'-4" A.F.F. (6" ABOVE DOOR FRAME OR MIRRORS), U.O.N. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- 1'X4' SURFACE MOUNTED FLUORESCENT STRIP OR INDUSTRIAL LIGHT FIXTURE.
- 1'X4' SURFACE MOUNTED FLUORESCENT EMERGENCY STRIP OR INDUSTRIAL LIGHT FIXTURE. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- CEILING OR WALL MOUNTED H.I.D. LIGHT FIXTURE.
- CEILING OR WALL MOUNTED H.I.D. EMERGENCY LIGHT FIXTURE. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- CEILING OR WALL SURFACE MOUNTED EXIT LIGHT FIXTURE. WALL MOUNTED 7'-4" A.F.F. (6" ABOVE DOOR FRAME OR MIRRORS), U.O.N. DARKENED SECTION DENOTES FACE. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- EMERGENCY BATTERY PACK MOUNTED 7'-0" A.F.F. U.O.N. (FIXTURES CONNECTED TO EMERGENCY GENERATOR)
- POLE MOUNTED AREA LIGHT
- TRACK LIGHT
- LIGHT FIXTURE TYPE DESIGNATION AS PER LETTER INDICATED. REFER TO SCHEDULE.
- S_K KEYED SWITCH
- S_2 TWO POLE SWITCH, LETTER DENOTES LIGHTS SWITCHED
- S_3 THREE WAY SWITCH, LETTER DENOTES LIGHTS SWITCHED
- S_4 FOUR WAY SWITCH, LETTER DENOTES LIGHTS SWITCHED
- S_{D_3} DIMMER SWITCH, LETTER DENOTES LIGHTS SWITCHED (3 DENOTES 3 WAY DIMMER)
- S_P SWITCH WITH PILOT LIGHT, LETTER DENOTES LIGHTS SWITCHED
- S_M MANUAL MOTOR SWITCH, W/OVERLOAD, NEMA 1 ENCLOSURE U.O.N.
- $S_{a,b,c}$ SINGLE POLE SWITCH, LOWER CASE LETTERS DENOTES LIGHTS SWITCHED.
- (TL) SINGLE WALL RECEPTACLE, NEMA 5-20R, 18" AFF U.O.N. (SUBSCRIPT "TL" INDICATES TWIST-LOCK, NEMA _____)
- RECESSED DUPLEX WALL RECEPTACLE, NEMA 5-20R, 18"AFF U.O.N.
- QUADRUPLEX WALL RECEPTACLE, NEMA 5-20R, 18" AFF U.O.N.
- Q DUPLEX FLOOR RECEPTACLE, NEMA 5-20R (Q: DENOTES QUADRUPLEX OUTLET).
- RECEPTACLE SURFACE WIREWAY, NEMA 5-20R, OUTLETS @ 18" O.C. TWO CIRCUIT, RECEPTACLES ALTERNATELY WIRED U.O.N.
- RECESSED DUPLEX WALL RECEPTACLE, NEMA 5-20R, UPPER HALF SWITCHED 18" AFF U.O.N.
- RECESSED DUPLEX WALL RECEPTACLE NEMA 5-20R, MOUNTED HORIZONTALLY 6" ABOVE COUNTER TOP AND IN BATHROOM @ 48" A.F.F. (U.O.N.)
- C RECESSED DUPLEX CEILING MTD. RECEPTACLE, NEMA 5-20R.
- P D COMBINATION POWER/COMMUNICATION FLOOR BOX (FLUSH MOUNTED)
- J_P COMBINATION POWER/COMMUNICATION POKE-THRU
- J_W WALL MOUNTED JUNCTION BOX FOR POWER CONNECTION TO SYSTEM FURNITURE.
- J_S WALL MOUNTED JUNCTION BOX FOR DATA/COMMUNICATION CONNECTION TO SYSTEM FURNITURE.
- R RANGE RECEPTACLE
- D DRYER RECEPTACLE
- SPECIAL RECEPTACLE, 36" AFF U.O.N.
- C CLOCK OUTLET MOUNTED 84" A.F.F. AND/OR CENTERED OVER DOOR
- TV TV WALL OUTLET, 18" AFF AND/OR 6" BELOW FINISHED CEILING. (VERIFY EXACT LOCATION PRIOR TO INSTALLATION)
- T COMBINATION PHONE/ DATA OUTLET FLOOR POKE THRU.
- WALL MOUNTED TELEPHONE OUTLET, WITH 3/4" E.C. STUBBED UP 6" ABOVE CEILING TILE. UNLESS OTHERWISE NOTED (P: DENOTES PUBLIC PHONE)
- WALL MOUNTED DATA OUTLET, WITH 3/4" E.C. STUBBED UP 6" ABOVE CEILING TILE. UNLESS OTHERWISE NOTED.
- COMBINATION PHONE/DATA WALL MOUNTED DATA OUTLET, WITH 1" E.C. STUBBED UP 6" ABOVE CEILING TILE. UNLESS OTHERWISE NOTED.
- J JUNCTION BOX (C= CEILING MOUNTED)
- PH PHOTOCELL
- INDIVIDUALLY MOUNTED CIRCUIT BREAKER /# POLES/TRIP/ENCLOSURE
- INDIVIDUALLY MOUNTED DISCONNECT SWITCH. SIZE/# POLES/ ENCLOSURE.
- F INDIVIDUALLY MOUNTED DISCONNECT SWITCH. SIZE/# POLES/FUSE SIZE ENCLOSURE.
- COMBINATION STARTER /SIZE/# POLES/FUSE SIZE/ENCLOSURE
- MAGNETIC MOTOR STARTER
- ALERT DISPATCH SYSTEM ALERT DEVICE

- SHUNT-TRIP PUSH BUTTON (U.O.N.)
- PUSH BUTTON CONTROL STATION (U.O.N.)
- C CONTACTOR
- PP POWER POLE (TWO COMPARTMENT) TEL/DATA AND POWER
- T TRANSFORMER
- TS TIME SWITCH W/OVERRIDE
- UT UTILITY TRANSFORMER
- TELEPHONE BACKBOARD
- PANELBOARD
- DP DISTRIBUTION PANEL
- AUTOMATIC TRANSFER SWITCH
- BRANCH CIRCUIT OR FEEDER RUN; CONCEALED IN CEILING OR WALL
- EXPOSED BRANCH CIRCUIT OR FEEDER RUN
- UNDERGROUND CIRCUIT OR CONDUIT
- BRANCH CIRCUIT HOMERUN - LONG HASHMARK WITH FLAG DENOTES GROUND WIRE, LONG HASHMARK W/O FLAG DENOTES NEUTRAL WIRE, SHORT HASHMARK DENOTES PHASE WIRE LONG HASHMARK WITH DOT DENOTES ISOLATED GROUND PER CIRCUIT.
- FLEXIBLE CONDUIT
- EXPLOSION PROOF SEAL
- CONDUIT RUN UP
- CONDUIT RUN DOWN
- GAS SOLENOID VALVE
- PIV POST INDICATOR VALVE
- FAP FIRE ALARM PANEL
- FAPA FIRE ALARM PANEL REMOTE ANNUNCIATOR
- F PULL STATION (48" AFF. TO TOP OF OPERATING LEVER)
- A ANSUL SYSTEM PULL STATION.
- FIREMEN'S TELEPHONE STATION
- HEAT DETECTOR
- SMOKE DETECTOR, CEILING MOUNTED U.O.N. (PHOTOELECTRIC TYPE)
- DUCT SMOKE DETECTOR (IONIZATION TYPE)
- F FIRE ALARM SPEAKER/STROBE (80" AFF. TO BOTTOM OF DEVICE)
- FIRE ALARM STROBE LIGHT (80" AFF TO BOTTOM OF DEVICE)
- MAGNETIC DOOR HOLDER
- B ELECTRIC BELL
- F/SD FIRE/SMOKE DAMPER
- VAV VARIABLE AIR VOLUME UNIT
- S CEILING MOUNTED PAGING SPEAKER
- 1 MOTOR, NUMBER INDICATES HORSEPOWER RATING
- WH WATER HEATER
- FS FLOW DETECTOR/SWITCH
- PS PRESSURE DETECTOR/SWITCH } FIRE SPRINKLER SYSTEM
- TS TAMPER DETECTOR/SWITCH
- F DUCT HEATER /SIZE/# POLES/FUSE SIZE/ENCLOSURE
- GROUND CONNECTION
- LIGHTNING ARRESTER TERMINAL ON ROOF
- G GENERATOR
- PB PUSH BUTTON DOOR RELEASE
- TVSS TRANSIENT VOLTAGE SURGE SUPPRESSER
- I INTERCOM PHONE
- DC ALARM SYSTEM DOOR CONTACT
- CR CARD READER
- CRE CARD READER INTERCONNECTED WITH ELEVATOR'S CONTROLS
- RE RELAY
- CB CODE BLUE PUSH BUTTON
- CB CODE BLUE LIGHT
- TCB TRAFFIC LIGHT CONTROL PUSH BUTTON
- KP ALARM SYSTEM KEY PAD
- MS ALARM SYSTEM MOTION SENSOR
- DC ALARM SYSTEM DOOR CONTACT.
- * INDICATES: FUSE TO BE PROVIDED AS PER MANUFACTURER'S RECOMMENDATIONS.

GENERAL ELECTRICAL NOTES

1. DO NOT SCALE THE ELECTRICAL DRAWINGS, UNLESS THE DRAWING SHOWS A SCALE.

2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE AND SHALL COMPLY WITH ALL LOCAL RULES AND ORDINANCES.

3. MINIMUM WIRE SIZES SHALL BE #12 AWG. EXCLUDING CONTROL WIRING UNLESS OTHERWISE NOTED. ALL CONDUCTORS SHALL BE STRANDED COPPER WITH THHW OR THHN INSULATION.

4. OUTLET BOXES SHALL BE PRESSED STEEL IN DRY LOCATIONS. CAST ALLOY WITH THREADED HUBS IN WET OR DAMP LOCATIONS AND SPECIAL ENCLOSURES FOR OTHER CLASSIFIED AREAS.

5. DISCONNECT SWITCHES SHALL BE H.P. RATED, HEAVY-DUTY, QUICK MAKE, QUICK-BREAK ENCLOSURES AS REQUIRED BY EXPOSURE.

6. MOTOR STARTERS SHALL BE MANUAL OR MAGNETIC, WITH OVERLOAD RELAYS IN EACH HOT LEG.

7. IT IS NOT THE INTENT OF THESE PLANS TO SHOW EVERY MINOR DETAIL OF CONSTRUCTION. THE CONTRACTOR IS EXPECTED TO FURNISH AND INSTALL ALL ITEMS FOR THE COMPLETE ELECTRICAL SYSTEM AND PROVIDE ALL REQUIREMENTS NECESSARY FOR THE EQUIPMENT TO BE PLACED IN PROPER WORKING ORDER.

8. ELECTRICAL SYSTEM SHALL BE COMPLETE AND EFFECTIVELY GROUNDED AS REQUIRED BY THE LATEST EDITION OF THE N.E.C. / SECTION 250, TABLE 250-94 AND TESTED PER SPECS.

9. ALL MATERIALS SHALL BE NEW AND BEAR THE UNDERWRITER'S LABELS, WHERE APPLICABLE.

10. ALL WORK SHALL BE PERFORMED BY A LICENSED ELECTRICAL CONTRACTOR IN A FIRST CLASS WORKMANLIKE MANNER. THE COMPLETED SYSTEM SHALL BE FULLY OPERATIVE AND ACCEPTED BY ENGINEER/ARCHITECT.

11. ALL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID INTERFERENCE WITH THE PROGRESS OF CONSTRUCTION.

12. CONTRACTOR SHALL GUARANTEE ALL MATERIALS AND WORKMANSHIP FREE FROM DEFECTS FOR A PERIOD OF NO LESS THAN A YEAR FROM THE DATE OF ACCEPTANCE.

13. CORRECTION OF ANY DEFECTS SHALL BE COMPLETED WITHOUT ADDITIONAL CHARGE AND SHALL INCLUDE REPLACEMENT OR REPAIR OF ANY OTHER PHASE OF THE INSTALLATION WHICH MAY HAVE BEEN DAMAGED THEREBY.

14. ALL REQUIRED INSURANCE SHALL BE PROVIDED FOR PROTECTION AGAINST LIABILITY OF PROPERTY DAMAGE FOR THE DURATION OF THE WORK.

15. CONTRACTOR SHALL PAY FOR ALL PERMITS, FEES, INSPECTIONS, AND TESTING.

16. THE ELECTRICAL INSTALLATION SHALL MEET ALL STANDARDS REQUIREMENTS OF POWER AND TELEPHONE COMPANIES.

17. IN GENERAL, UNDERGROUND RACEWAYS SHALL BE NOT LESS THAN 1" CONDUITS.

18. ALL CIRCUIT BREAKERS, TWO AND THREE POLE, TO BE COMMON TRIP NO TIE HANDLES OR TANDEMS WILL BE ACCEPTED.

19. ALL FUSES, UNLESS OTHERWISE NOTED ON DRAWINGS, SHALL BE CURRENT LIMITED FUSES (C.L.) RATED FOR 200,000 A.I.C.

20. BEFORE SUBMITTING A BID THE CONTRACTOR SHALL VISIT THE SITE AND DETERMINE THE CONDITIONS AT THE SITE AND ALL EXISTING STRUCTURES IN ORDER TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND ELECTRICAL SYSTEMS WHICH WILL IN ANY WAY AFFECT THE WORK REQUIRED UNDER THE CONTRACT. THE CONTRACTOR SHALL INFORM THE ENGINEER IN WRITING OF ANY DISCREPANCIES FOUND DURING SAID SITE VISIT. NO SUBSEQUENT INCREASE IN CONTRACT COST WILL BE ALLOWED FOR ADDITIONAL WORK REQUIRED BECAUSE OF CONTRACTOR'S FAILURE TO FULFILL THIS REQUIREMENT.

ABBREVIATIONS

400HZ	FOUR HUNDRED CYCLE POWER	EP	ELECTRIC-PNEUMATIC SWITCH	MCC	MOTOR CONTROL CENTER
AFF	ABOVE FINISHED FLOOR	EWC	ELECTRIC WATER COOLER	MDP	MAIN DISTRIBUTION PANEL
AG	ABOVE GRADE	EF	EXHAUST FAN	MOD	MOTOR OPERATED DAMPER
AC	ABOVE COUNTER (6" ABOVE BACKSPLASH)	FCU	FAN COIL UNIT	NL	NIGHT LIGHT
A/C	AIR CONDITIONING UNIT	FPL	FLORIDA POWER AND LIGHT	OC	ON CENTER
ACC	AIR COOLED CONDENSER	FPVAV	FAN POWERED VARIABLE AIR VOLUME BOX	RTU	ROOF TOP UNIT
AHU	AIR HANDLING UNIT	FSD	FIRE SMOKE DAMPER	SRF	SMOKE REMOVAL FAN
ATS	AUTOMATIC TRANSFER SWITCH	GFCI	GROUND FAULT CIRCUIT INTERRUPTER	SF	SUPPLY FAN
BKR	BREAKER	HVU	HEATING VENTILATING UNIT	TB	TERMINAL BOX
CHWP	CHILLED WATER PUMP	HPF	HIGH POWER FACTOR	UH	UNIT HEATER
CH	CHILLER	HWP	HOT WATER PUMP	U.O.N.	UNLESS OTHERWISE NOTED
CKT	CIRCUIT	IG	ISOLATED GROUND	VAV	VARIABLE AIR VOLUME UNIT
CU-CLAD	COPPER CLAD	MCC	MOTOR CONTROL CENTER	VFD	VARIABLE FREQUENCY DRIVE
CWP	CONDENSER WATER PUMP	MDP	MAIN DISTRIBUTION PANEL	WH	WATER HEATER
CT	COOLING TOWER	MCC	MOTOR CONTROL CENTER	WP	WEATHER PROOF
EDH	ELECTRIC DUCT HEATER	MDP	MAIN DISTRIBUTION PANEL	XP	EXPLOSION PROOF
EP	ELECTRIC-PNEUMATIC SWITCH				
EWC	ELECTRIC WATER COOLER				

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Oct. 26, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

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PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ABBREVIATIONS, LEGEND & STANDARD ELECTRICAL NOTES
528 NW 2ND STREET

BID SET

SHEET NO. E01 OF 01

TOTAL: 07

CAD FILE: 12200-MULTI-ELEC

DRAWING FILE NO. 4-140-05

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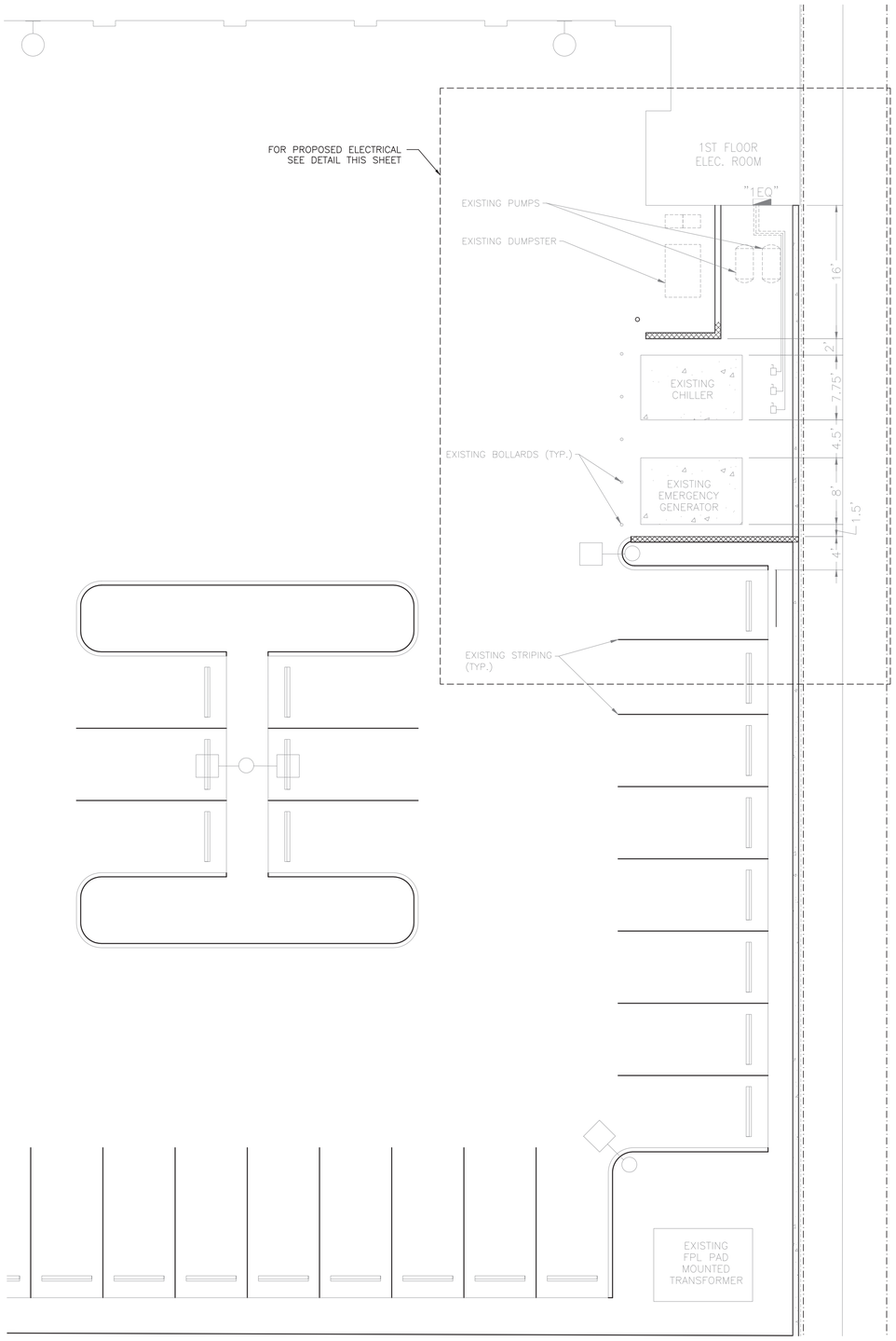
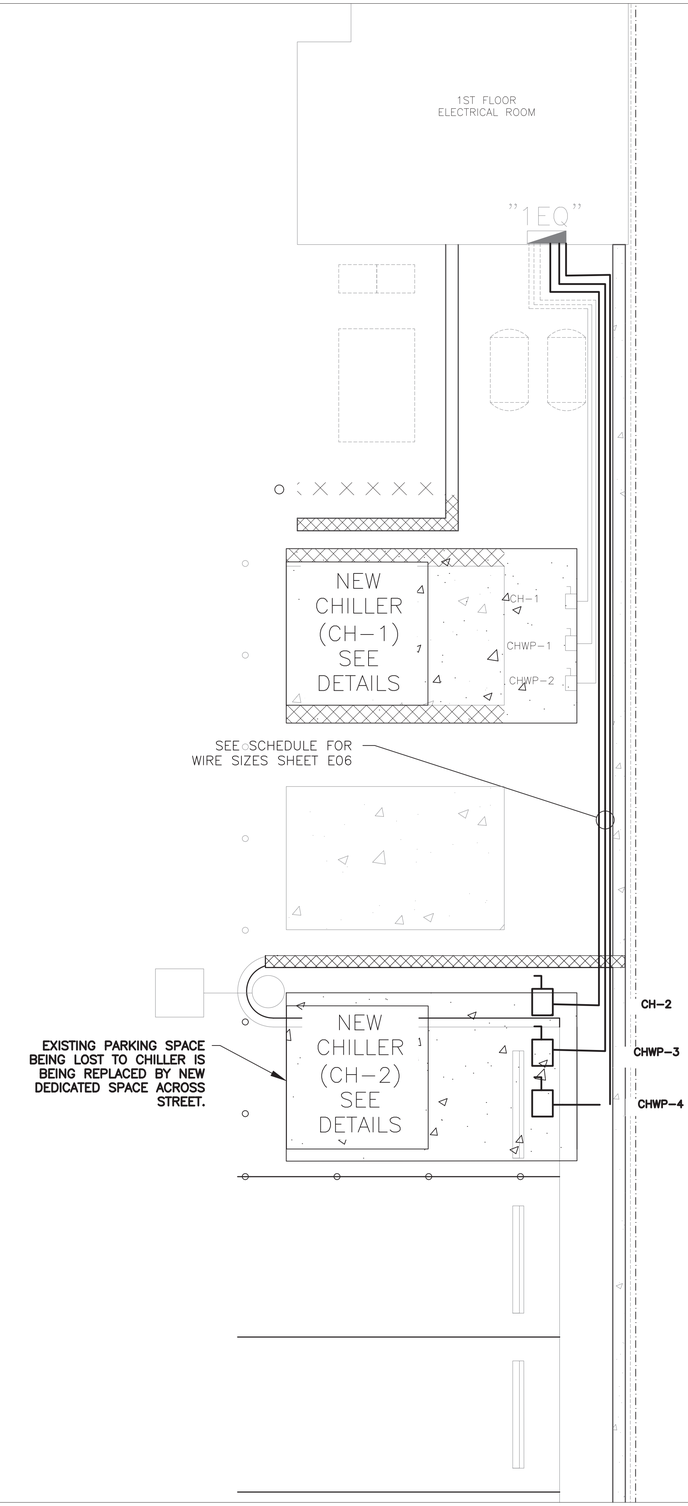


EXISTING ELECTRICAL SITE PLAN

SCALE: 1/8"-1'-0"



PROPOSED ELECTRICAL SITE PLAN

SCALE: 1/8"-1'-0"

BID SET

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ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

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PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ELECTRICAL SITE PLAN

528 NW 2ND STREET

SHEET NO.	OF
E02	02
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POWER SUPPLY SCHEDULE FOR FIRST FLOOR

ITEM	UNIT IDENTIFICATION	CIRCUIT	CONDUIT	BRANCH NO.	BREAKER	REQUIRED WORK	LENGTH (FT)
1	AHU-1	4X#12	1/2"	1EQ-20,22,24	20A	REWIRING FROM SINGLE PHASE TO 3 PHASE	120'
2	AHU-2	3X#10+1X#10G	3/4"	1EQ-2,4,6	30A	REMAIN AS IS	N/A
3	CHWP1 & P2	8X#12	1/2"	1EQ-8,10,12,14,16,18	20A	EXISTING CONDUIT EXTENDED TO PUMP LOCATION UNDER CH-1 & REWIRE	30'
4	CHWP3 & P4	8X#12	1/2"	1EQ-3,5,7,21,23,25	20A	EXISTING CONDUIT EXTENDED TO PUMP LOCATION UNDER CH-1 & REWIRE	60'
5	CHILLER-1	3X#10+1#6G	1-1/2"	1EQ-9,11,13	150A	NEW CIRCUIT	50'
6	CHILLER-2	3X#10+1X#6G	1-1/2"	1EQ-27,29,31	150A	NEW CIRCUIT	60'
7	SERVICE DISCONNECT	CH-1, CH-2	N/A	N/A	200A	ONE NEW SERVIVE NON-FUSABLE DISCONNECT	N/A
8	SERVICE DISCONNECT	P-3 &P-4	N/A	N/A	100A	TWO NON-FUSABLE DISCONNECTS	N/A
9	150A/480V/3PHASE BREAKER	CH-1, CH-2	N/A	1EQ- 9,11, 13 1EQ 27,29,31	150A	TWO BREAKERS	N/A
10	20A/480V/3PHASE	CHWP 3,4 AHU1-1	N/A	1EQ - 3, 5, 7 1EQ 21,23,25 1EQ 20,22,24	20A	THREE BREAKERS	N/A

EXISTING "1EQ" PANEL

PANEL– "1EQ"
LOCATION: MAIN ELECT. ROOM
☐ FLUSH ■ TOP FEED
■ SURFACE ☐ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE
400 AMP BUS
■ GROUND BUS
☐ LUGS ONLY
NEMA –

■ NEUTRAL
■ FULL
☐ 50%
☐ 200%

■ MAIN BKR.
FRAME 400 A.
TRIP 300 A.
☐ SHUNT TRIP

@ 22K AIC
480 VOLTS

LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT. No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
AHU–1	#12, 1/2" C.	1	20	2.0	1	–			2	5.6				
VAV 1–1	#12, 1/2" C.	1	20	3.0	3		–		4	5.6	30	3	3#10, 1#10G. IN 3/4"C.	AHU–2
VAV 1–2	#12, 1/2" C.	1	20	4.0	5			–	6	5.6				
VAV 1–3	#12, 1/2" C.	1	20	3.0	7	–			8	2.0				
SECURITY LIGHTS	#12, 1/2" C.	1	20	27	9		–		10	2.0	20	3	3#12, 1#12G. IN 1/2"C.	CHWP–1
SPARE	–	1	20	27	11			–	12	2.0				
SPARE	–	1	20	27	13	–			14	2.0				
EXHAUST EXTRACTOR SYSTEM	3#10, 1#10G. IN 3/4"C.	3	150	5.5	15		–		16	2.0	20	3	3#12, 1#12G. IN 1/2"C.	CHWP–2
				5.5	17			–	18	2.0				
				5.5	19	–			20	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	21		–		22	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	23			–	24	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	25	–			26	0.5	20	1	–	SPARE
SPACE	–	–	–	–	27		–		28	0.5	20	1	–	SPARE
SPACE	–	–	–	–	29			–	30	–	–	–	–	SPACE
SPACE	–	–	–	–	31	–			32	–	–	–	–	SPACE
SPACE	–	–	–	–	33		–		34	–	–	–	–	SPACE
SPACE	–	–	–	–	35			–	36	–	–	–	–	SPACE
PANEL "3EQ"	3#3, 1#8G. IN 1 1/4"C.	3	100	10.7	37	–			38	6.2	100	3	3#3, 1#8G. IN 1 1/4"C.	PANEL "2EQ"
				10.7	39		–		40	6.2				
				10.7	41			–	42	6.2				
						–	–	–						

FED FROM: ATS #1

TOTAL CONNECTED LOAD: 193 KVA = 232.5 AMPS
TOTAL DEMAND LOAD: – KVA = – AMPS

NOTES:

PROPOSED "1EQ" PANEL

REVISED PANEL– "1EQ"
LOCATION: MAIN ELECT. ROOM
☐ FLUSH ■ TOP FEED
■ SURFACE ☐ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE
400 AMP BUS
■ GROUND BUS
☐ LUGS ONLY
NEMA –

■ NEUTRAL
■ FULL
☐ 50%
☐ 200%

■ MAIN BKR.
FRAME 400 A.
TRIP 300 A.
☐ SHUNT TRIP

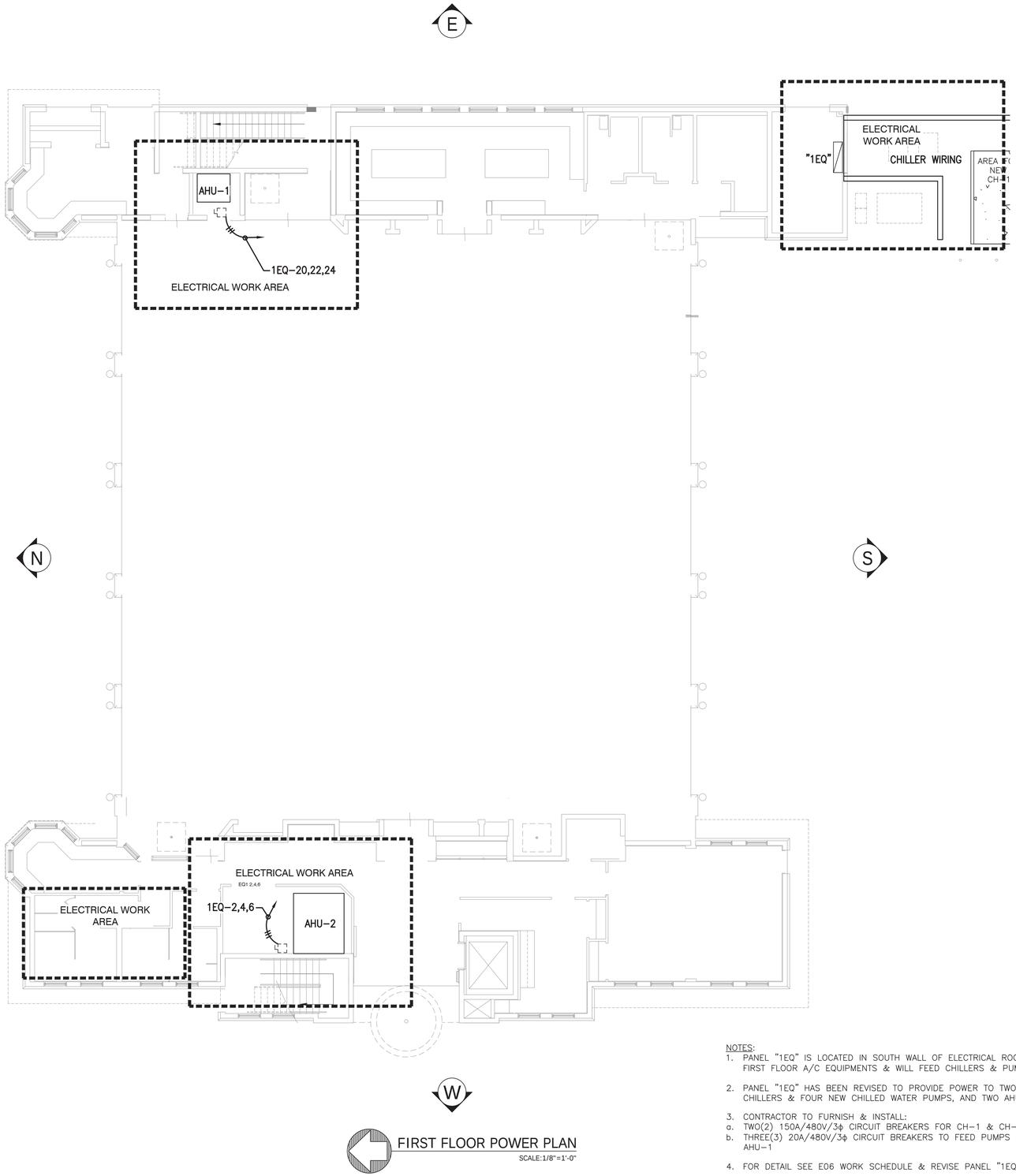
@ 22K AIC
480 VOLTS

LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT. No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
SECURITY LIGHT/EXIST.	#12, 1/2" C.	1	20	2.0	1	–			2	5.6				
CHWP–3 – NEW	**3#12+1#12G IN 1/2" C**	**3**	**20**	**3.0**	**3**		–		4	5.6	30	3	3#10, 1#10G. IN 3/4"C.	AHU–2 – EXIST.
				4.0	**5**			–	6	5.6				
				3.0	**7**	–			8	2.0				
CH–1 – NEW	**3#10, 1#6G. IN 1 1/2"C.**	**3**	**150**	**27**	**9**		–		10	2.0	20	3	3#12, 1#12G. IN 1/2"C.	CHWP–1 – EXIST.
				27	**11**			–	12	2.0				
				27	**13**	–			14	2.0				
EXHAUST EXTRACTOR SYSTEM / EXIST.	3#10, 1#10G. IN 3/4"C.	3	150	5.5	15		–		16	2.0	20	3	3#12, 1#12G. IN 1/2"C.	CHWP–2 – EXIST.
				5.5	17			–	18	2.0				
				5.5	19	–			**20**	**0.5**	**20**	**1**	**3X#12 + 1X#12G IN 1/2"C.**	****AHU–1 – ADD 1 PHASE TO EXISTING**
CHWP–4 – NEW	**3#12+1#12G IN 1/2" C**	**3**	**20**	**0.5**	**21**		–		**22**	**0.5**	**20**	**1**		
				0.5	**23**			–	**24**	**0.5**	**20**	**1**		
				0.5	**25**	–			26	0.5	20	1	–	SPARE
CH–2 – NEW	**3#10+1#6G IN 1–1/2" C**	**3**	**150**		**27**	–			28	0.5	20	1	–	SPARE
					29		–		30	–	–	–	–	SPACE
					31			–	32	–	–	–	–	SPACE
SPARE	–	1	20	0.5	33	–			34	–	–	–	–	SPACE
SPARE	–	1	20	0.5	35		–		36	–	–	–	–	SPACE
PANEL "3EQ" – EXIST.	3#3, 1#8G. IN 1 1/4"C.	3	100	10.7	37	–			38	6.2	100	3	3#3, 1#8G. IN 1 1/4"C.	PANEL "2EQ" – EXIST.
				10.7	39		–		40	6.2				
				10.7	41			–	42	6.2				
						–	–	–						

FED FROM: ATS #1

TOTAL CONNECTED LOAD: 238.4 KVA = 358 AMPS
TOTAL DEMAND LOAD: – KVA = – AMPS

NOTES:



FIRST FLOOR POWER PLAN
SCALE:1/8"=1'-0"

NOTES:
1. PANEL "1EQ" IS LOCATED IN SOUTH WALL OF ELECTRICAL ROOM IS FEEDING FIRST FLOOR A/C EQUIPMENTS & WILL FEED CHILLERS & PUMPS.
2. PANEL "1EQ" HAS BEEN REVISED TO PROVIDE POWER TO TWO NEW CHILLERS & FOUR NEW CHILLED WATER PUMPS, AND TWO AHUS.
3. CONTRACTOR TO FURNISH & INSTALL:
   a. TWO(2) 150A/480V/3ϕ CIRCUIT BREAKERS FOR CH–1 & CH–2
   b. THREE(3) 20A/480V/3ϕ CIRCUIT BREAKERS TO FEED PUMPS #3 & #4 & AHU–1
4. FOR DETAIL SEE E06 WORK SCHEDULE & REVISE PANEL "1EQ" SCHEDULE.

BID SET

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL (954) 828-5079
FAX (954) 828-5079

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Oct. 26, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
1ST FLOOR POWER & COMMUNICATIONS PLAN
528 NW 2ND STREET

SHEET NO. E03 OF 03
TOTAL: 07
CAD FILE: 12200–MULTI–ELEC
DRAWING FILE NO. 4–140–05

Z:\12000\200–299\12200\DESIGN\DRAWINGS\CURRENT\BID\12200–MULTI–ELEC.DWG

11/20/2017 9:24 AM

POWER SUPPLY TO AHUS ELECTRICAL WIRING SCHEDULE

ITEM	UNIT IDENTIFICATION	CIRCUIT	CONDUIT	BRANCH NO.	BREAKER	INSTALLATION	REQUIRED WORK	COND. EXIST. (FT)	5X#12 WIRING (FT.)
1	AHU2-1	5X#12 THHN	1/2"	2EQ-1,3,5	20A	RECONNECTING AHU2-1	ONLY CONNECTION	0'	45'
2	AHU2-2	5X#12 THHN	1/2"	2EQ-7,9,11	20A	NEW CIRCUIT FROM PANEL	NEW CIRCUIT	60'	70'
3	AHU2-3	5X#12 THHN	1/2"	2EQ-13,15,17	20A	VAV2-7 TO AHU2-3	CIRCUIT EXTENSION	6'	90'
4	AHU2-4	5X#12 THHN	1/2"	2EQ-19,21,23	20A	NEW CIRCUIT FROM PANEL	NEW CIRCUIT	50'	50'
5	AHU2-5	5X#12 THHN	1/2"	2EQ-25,27,29	20A	VAV2-5 TO AHU2-5	CIRCUIT EXTENSION	18'	135'
6	AHU2-6	5X#12 THHN	1/2"	2EQ-2,4,6	20A	VAV2-6 TO AHU2-6	ONLY CONNECTION	0'	120'
7	AHU2-7	5X#12 THHN	1/2"	2EQ-8,10,12	20A	VAV2-4 TO AHU2-7	CIRCUIT EXTENSION	35'	120'
8	AHU2-8	5X#12 THHN	1/2"	2EQ-14,16,18	20A	VAV2-1 TO AHU2-8	INTERRUPTION OF 2EQ-3 & DIVERT TO AHU-8	30'	170'
9	AHU2-9	5X#12 THHN	1/2"	2EQ- 20,22,24	20A	VAV2-3 TO AHU2-9	EXTEND THE CIRCUIT	25'	120'
10	20A/480V/3PHASE BREAKER	5X#12 THHN	1/2"	2EQ - 1 TO 29 & 2EQ 12 TO 24	20A	PROVIDE & INSTALL 9: 20A/480V/3PHASE	FURNISH & INSTALL 9 CIRCUIT BREAKERS	N/A	N/A

EXISTING "2EQ" PANEL

PANEL– "2EQ" — LOCATION: ☐ FLUSH ☐ TOP FEED ■ SURFACE ■ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE — 100 AMP BUS — ■ GROUND BUS — ☐ LUGS ONLY — NEMA –

■ NEUTRAL ■ FULL ☐ 50% ☐ 200%

■ MAIN BKR. FRAME 100 A. TRIP 100 A. ☐ SHUNT TRIP

22K AIC @ 480 VOLTS

LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT. No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
VAV 2–1, 2–2	#12, 1/2" C.	1	20	2.1	1	–	/	\	2	3.0	20	1	#12, 1/2" C.	VAV 2–4
VAV 2–3	#12, 1/2" C.	1	20	2.0	3	/	\	–	4	2.0	20	1	#12, 1/2" C.	VAV 2–5
VAV 2–9	#12, 1/2" C.	1	20	1.0	5	\	–	/	6	1.0	20	1	#12, 1/2" C.	VAV 2–6, 2–10
SPARE	–	1	20	0.5	7	–	/	\	8	2.1	20	1	#12, 1/2" C.	VAV 2–7, 2–8
SPARE	–	1	20	0.5	9	/	\	–	10	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	11	\	–	/	12	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	13	–	/	\	14	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	15	/	\	–	16	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	17	\	–	/	18	0.5	20	1	–	SPARE
SPACE	–	–	–	–	19	–	/	\	20	–	–	–	–	SPACE
SPACE	–	–	–	–	21	/	\	–	22	–	–	–	–	SPACE
SPACE	–	–	–	–	23	\	–	/	24	–	–	–	–	SPACE
SPACE	–	–	–	–	25	–	/	\	26	–	–	–	–	SPACE
SPACE	–	–	–	–	27	/	\	–	28	–	–	–	–	SPACE
SPACE	–	–	–	–	29	\	–	/	30	–	–	–	–	SPACE
SPACE	–	–	–	–	31	–	/	\	32	–	–	–	–	SPACE
SPACE	–	–	–	–	33	/	\	–	34	–	–	–	–	SPACE
SPACE	–	–	–	–	35	\	–	/	36	–	–	–	–	SPACE
SPACE	–	–	–	–	37	–	/	\	38	–	–	–	–	SPACE
SPACE	–	–	–	–	39	/	\	–	40	–	–	–	–	SPACE
SPACE	–	–	–	–	41	\	–	/	42	–	–	–	–	SPACE
						–	–	–						

FED FROM: PANEL "1EQ"

TOTAL CONNECTED LOAD: 18.7 KVA = 22.5 AMPS

TOTAL DEMAND LOAD: — KVA = — AMPS

NOTES:

PROPOSED "2EQ" PANEL

REVISED PANEL– "2EQ" — LOCATION: ☐ FLUSH ☐ TOP FEED ■ SURFACE ■ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE — 100 AMP BUS — ■ GROUND BUS — ☐ LUGS ONLY — NEMA –

■ NEUTRAL ■ FULL ☐ 50% ☐ 200%

■ MAIN BKR. FRAME 100 A. TRIP 100 A. ☐ SHUNT TRIP

22K AIC @ 480 VOLTS

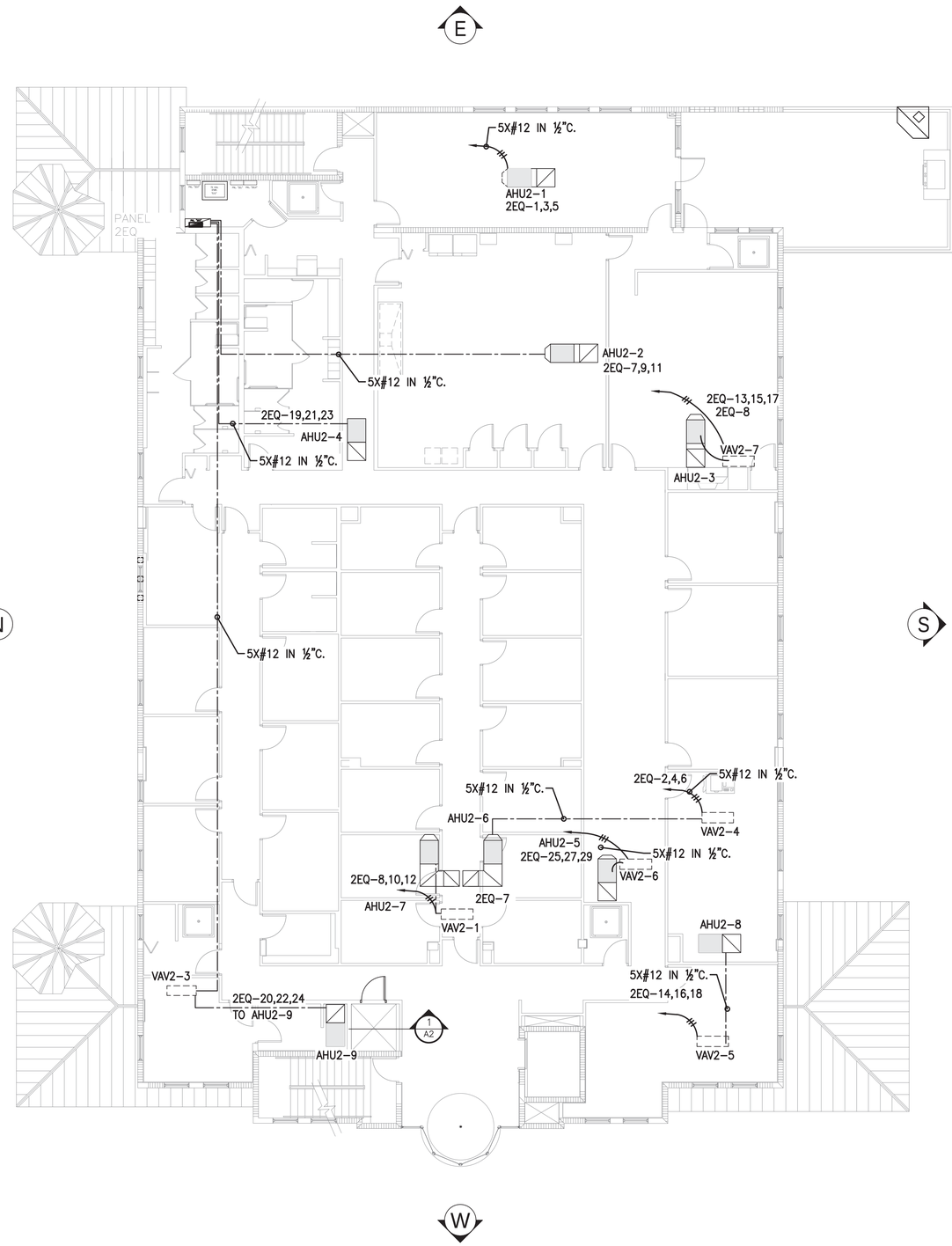
LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT. No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
					1	–	/	\	2					
AHU2–1–NEW	**5X#12, 1/2" C.**	**3**	**20**	**0.66**	**3**	/	\	–	**4**	**0.66**	**20**	**3**	**5X#12, 1/2" C.**	**AHU2–6**
					5	\	–	/	**6**					
					7	–	/	\	**8**					
AHU2–2–NEW	**5X#12, 1/2" C.**	**3**	**20**	**0.66**	**9**	/	\	–	**10**	**0.66**	**20**	**3**	**5X#12, 1/2" C.**	**AHU2–7**
					11	\	–	/	**12**					
					13	–	/	\	**14**					
AHU2–3–NEW	**5X#12, 1/2" C.**	**3**	**20**	**0.66**	**15**	/	\	–	**16**	**1.75**	**20**	**3**	**5X#12, 1/2" C.**	**AHU2–8**
					17	\	–	/	**18**					
					19	–	/	\	**20**					
AHU2–4–NEW	**5X#12, 1/2" C.**	**3**	**20**	**0.66**	**21**	/	\	–	**22**	**1.75**	**20**	**3**	**5X#12, 1/2" C.**	**AHU2–9**
					23	\	–	/	**24**					
					25	–	/	\	26	–	–	–	–	SPACE
AHU2–5–NEW	**5X#12, 1/2" C.**	**3**	**20**	**0.66**	**27**	/	\	–	28	–	–	–	–	SPACE
					29	\	–	/	30	–	–	–	–	SPACE
SPACE	–	–	–	–	31	–	/	\	32	–	–	–	–	SPACE
SPACE	–	–	–	–	33	/	\	–	34	–	–	–	–	SPACE
SPACE	–	–	–	–	35	\	–	/	36	–	–	–	–	SPACE
SPACE	–	–	–	–	37	–	/	\	38	–	–	–	–	SPACE
SPACE	–	–	–	–	39	/	\	–	40	–	–	–	–	SPACE
SPACE	–	–	–	–	41	\	–	/	42	–	–	–	–	SPACE
						–	–	–						

FED FROM: PANEL "1EQ"

TOTAL CONNECTED LOAD: 8.5 KVA = 10.2 AMPS

TOTAL DEMAND LOAD: — KVA = — AMPS

NOTES:



SECOND FLOOR POWER / A/C ELECTRICAL PLAN

SCALE:1/8"=1'-0"

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Oct. 26, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
2ND FLOOR POWER &
STANDARD ELECTRICAL NOTES
528 NW 2ND STREET

BID SET

SHEET NO. E04 OF 04

TOTAL: 07

CAD FILE: 12200–MULTI–ELEC

DRAWING FILE NO. 4–140–05

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POWER SUPPLY TO AHUS-THIRD FLOOR-SCHEDULE OF WIRING									
ITEM	UNIT IDENTIFICATION	CIRCUIT	CONDUIT	BRANCH NO.	BREAKER	INSTALLATION	REQUIRED WORK	COND. LENGTH (FT.)	WIRING LENGTH (FT.)
1	AHU3-1	5X#12	1/2"	3EQ-7,9,11	20A	FROM VAV3-9 TO AHU3-1	EXTENSION OF CIRCUIT	25'	50'
2	AHU3-2	5X#12	1/2"	3EQ-13,15,17	20A	FROM VAV3-7 TO AHU3-2	EXTENSION OF CIRCUIT	15'	60'
3	AHU3-3	5X#12	1/2"	3EQ-2,4,6	20A	FROM VAV3-6 TO AHU3-3	EXTENSION OF CIRCUIT	5'	50'
4	AHU3-4	5X#12	1/2"	3EQ-8,10,12	20A	FROM VAV3-1 TO AHU3-4	EXTENSION OF CIRCUIT	8'	120'
5	AHU3-5	5X#12	1/2"	3EQ-14,16,18	20A	FROM VAV3-3 TO AHU3-5	EXTENSION OF CIRCUIT	10'	110'
6	20A/480V/3PHASE BREAKERS			3EQ-7,9,11,13,15,17 3EQ-2,4,6,8,10,12,14,16,18	20A	FURNISH AND INSTALL FIVE (5) 20A/480V/3PHASE BREAKERS	FRUNUSH & INSTALLATION		
POWER SUPPLY TO ROOFTOP O.A. UNIT SCHEDULE OF WIRING TO OUTSIDE AIR UNIT									
1	O.A. UNIT	4X#12	1/2"	EQ3-1,3,5	30A	FROM EXISTING AHU-3	EXTENDED TO ROOFTOP	8'	130'

EXISTING "3EQ" PANEL

PANEL–"3EQ"
LOCATION:
☐ FLUSH ☐ TOP FEED
■ SURFACE ■ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE
100 AMP BUS
■ GROUND BUS
☐ LUGS ONLY
NEMA —

■ NEUTRAL
■ FULL
☐ 50%
☐ 200%

■ MAIN BKR.
FRAME 100 A.
TRIP 100 A.
☐ SHUNT TRIP

22K AIC @ 480 VOLTS

LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
AHU–3	3#12, 1#12G. IN 1/2"C.	3		3.0	1	–			2	3.0	20	1	#12, 1/2" C.	VAV 3–1
				3.0	3		–		4	2.0	20	1	#12, 1/2" C.	VAV 3–2
			20	3.0	5			–	6	3.0	20	1	#12, 1/2" C.	VAV 3–3
VAV 3–7	#10, 3/4"C.	1	30	6.0	7	–			8	2.1	20	1	#12, 1/2" C.	VAV 3–4, 3–5
VAV 3–9	#12, 1/2"C.	1	20	2.0	9		–		10	1.1	20	1	#12, 1/2" C.	VAV 3–6, 3–8
SPARE	–	1	20	0.5	11			–	12	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	13	–			14	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	15		–		16	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	17			–	18	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	19	–			20	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	21		–		22	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	23			–	24	0.5	20	1	–	SPARE
SPACE		–	–	–	25	–			26	–	–	–	–	SPACE
SPACE	–	–	–	–	27		–		28	–	–	–	–	SPACE
SPACE	–	–	–	–	29			–	30	–	–	–	–	SPACE
SPACE	–	–	–	–	31	–			32	–	–	–	–	SPACE
SPACE	–	–	–	–	33		–		34	–	–	–	–	SPACE
SPACE	–	–	–	–	35			–	36	–	–	–	–	SPACE
SPACE	–	–	–	–	37	–			38	–	–	–	–	SPACE
SPACE	–	–	–	–	39		–		40	–	–	–	–	SPACE
SPACE	–	–	–	–	41			–	42	–	–	–	–	SPACE
						–	–	–						

FED FROM: PANEL "1EQ"

TOTAL CONNECTED LOAD: 32.2 KVA = 38.7 AMPS
TOTAL DEMAND LOAD: — KVA = — AMPS

NOTES:

PROPOSED "3EQ" PANEL

REVISED PANEL–"3EQ"
LOCATION:
☐ FLUSH ☐ TOP FEED
■ SURFACE ■ BOTTOM FEED

480/277 VOLTS, 3 ø 4 WIRE
100 AMP BUS
■ GROUND BUS
☐ LUGS ONLY
NEMA —

■ NEUTRAL
■ FULL
☐ 50%
☐ 200%

■ MAIN BKR.
FRAME 100 A.
TRIP 100 A.
☐ SHUNT TRIP

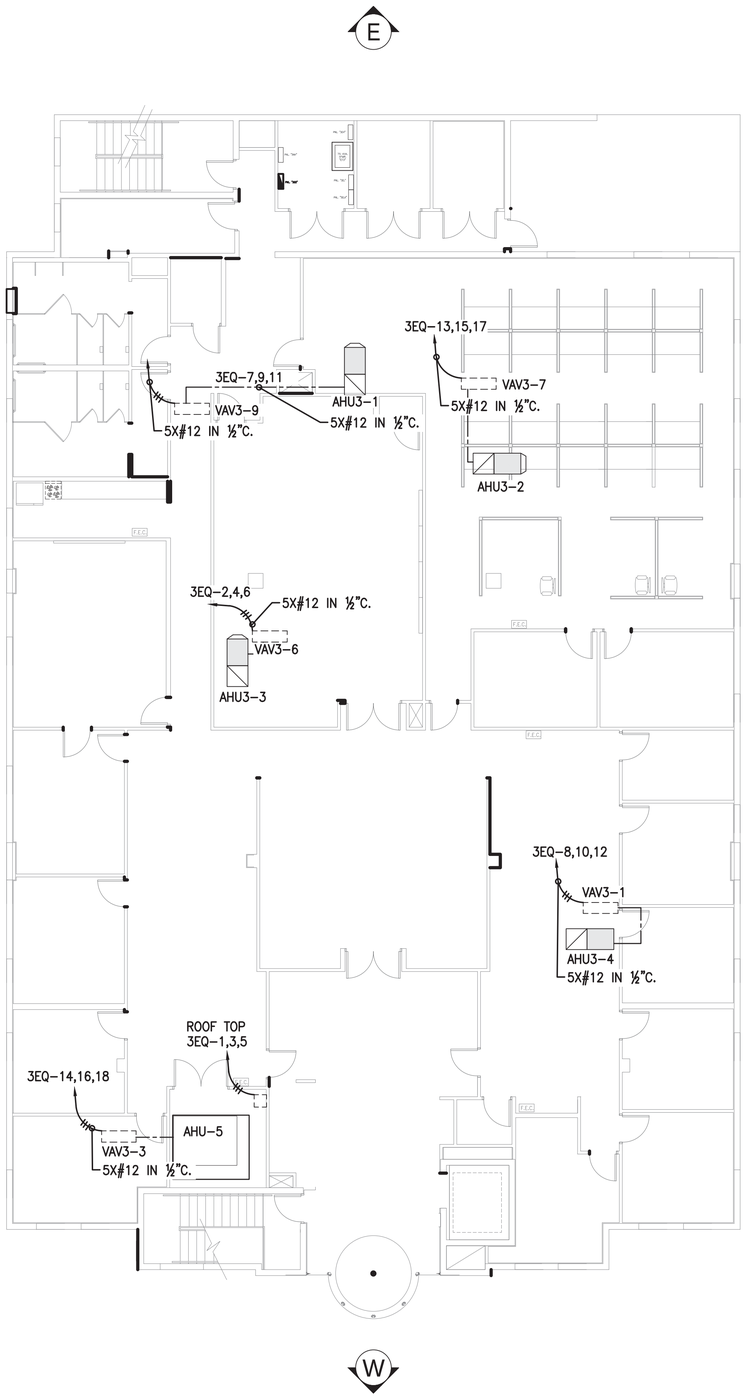
22K AIC @ 480 VOLTS

LOAD DESCRIPTION	WIRE & CONDUIT	POLE	AMP TRIP	CKT. K.V.A.	CKT. No.	LOAD(KVA) øA	LOAD(KVA) øB	LOAD(KVA) øC	CKT No.	CKT. K.V.A.	AMP TRIP	POLE	WIRE & CONDUIT	LOAD DESCRIPTION
ROOFTOP OUTSIDE AIR UNIT	3#12, 1#12G. IN 1/2"C.	3	20	3.2	1				2					
					3				4	1.75	20	3	5X#12 IN ½" C.	AHU3–3
					5			–	6					
AHU3–1– NEW	**5X#12 IN ½" C.**	**3**	**20**	**1.75**	**7**	–			**8**					
					9		–		**10**	**1.75**	**20**	**3**	**5X#12 IN ½" C.**	**AHU3–4**
					11			–	**12**					
AHU3–2– NEW	**5X#12 IN ½" C.**	**3**	**20**	**1.75**	**13**	–			**14**					
					15		–		**16**	**1.75**	**20**	**3**	**5X#12 IN ½" C.**	**AHU3–5**
					17			–	**18**					
SPARE	–	1	20	0.5	19	–			20	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	21		–		22	0.5	20	1	–	SPARE
SPARE	–	1	20	0.5	23			–	24	0.5	20	1	–	SPARE
SPACE		–	–	–	25	–			26	–	–	–	–	SPACE
SPACE	–	–	–	–	27		–		28	–	–	–	–	SPACE
SPACE	–	–	–	–	29			–	30	–	–	–	–	SPACE
SPACE	–	–	–	–	31	–			32	–	–	–	–	SPACE
SPACE	–	–	–	–	33		–		34	–	–	–	–	SPACE
SPACE	–	–	–	–	35			–	36	–	–	–	–	SPACE
SPACE	–	–	–	–	37	–			38	–	–	–	–	SPACE
SPACE	–	–	–	–	39		–		40	–	–	–	–	SPACE
SPACE	–	–	–	–	41			–	42	–	–	–	–	SPACE
						–	–	–						

FED FROM: PANEL "1EQ"

TOTAL CONNECTED LOAD: 15.00 KVA = 18.06 AMPS
TOTAL DEMAND LOAD: — KVA = — AMPS

NOTES:



THIRD FLOOR POWER A/C ELECTRICAL PLAN
SCALE:1/8"=1'-0"

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828–5059 FAX: (954) 828–5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Oct. 26, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
3RD FLOOR POWER &
COMMUNICATIONS PLAN
528 NW 2ND STREET

BID SET

SHEET NO. E05 OF 05
TOTAL: 07
CAD FILE: 12200–MULTI–ELEC
DRAWING FILE NO. 4–140–05

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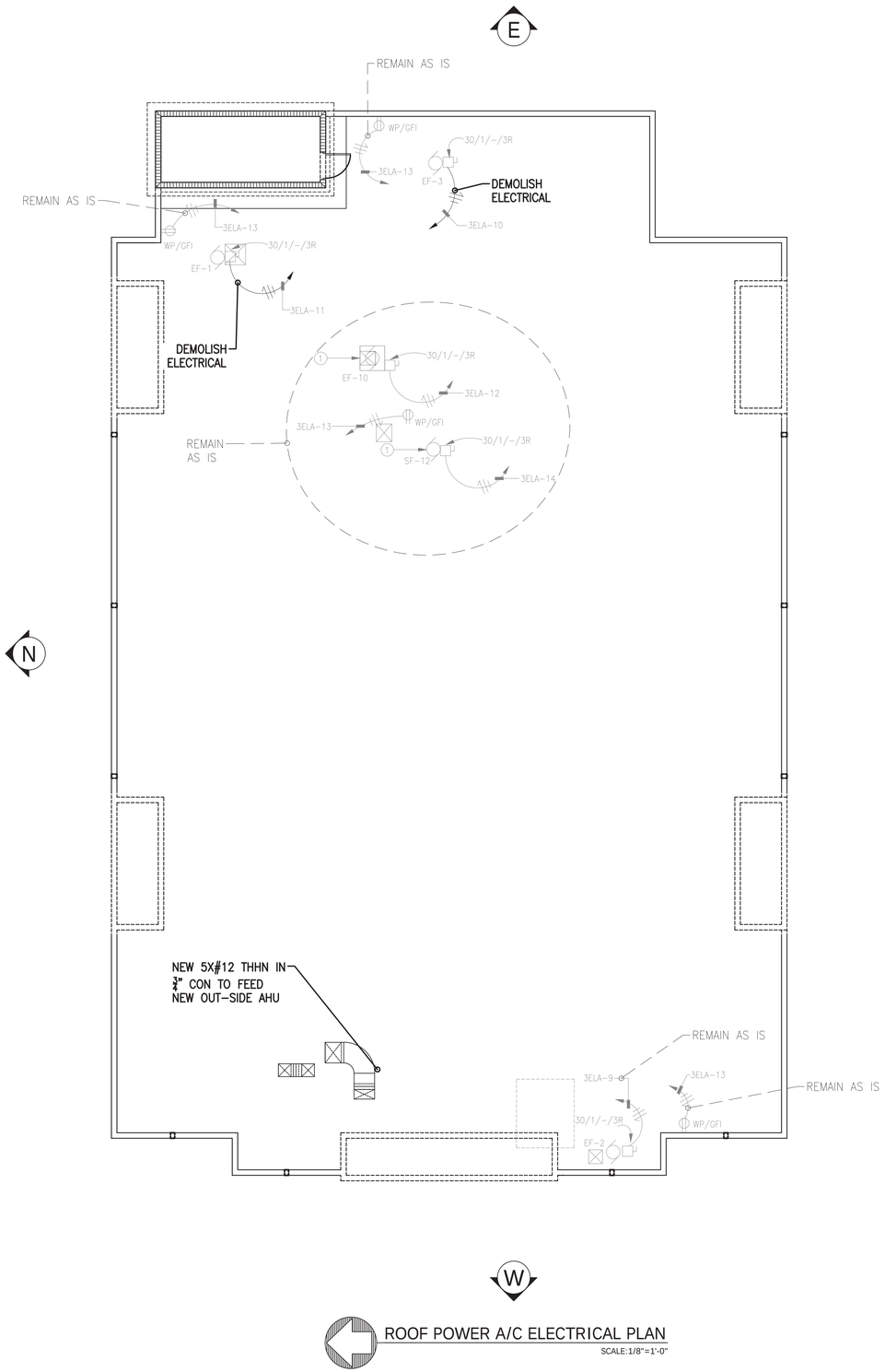

ROOF POWER A/C ELECTRICAL PLAN

SCALE: 1/8"=1'-0"

KEY NOTES:

(1) EXHAUST AND SUPPLY FANS TO BE CONTROLLED FROM KITCHEN HOOD. KITCHEN HOOD PROVIDED BY OTHERS.

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5069
FAX: (954) 828-5071

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Oct. 26, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

BID SET

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ROOFTOP POWER &
A/C ELECTRICAL
528 NW 2ND STREET

SHEET NO.	OF
E06	06
TOTAL:	07
CAD FILE: 12200-MULTI-ELEC	
DRAWING FILE NO. 4-140-05	

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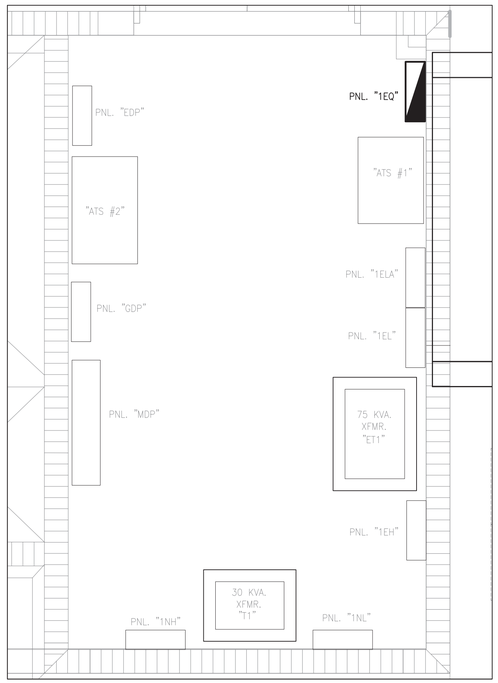
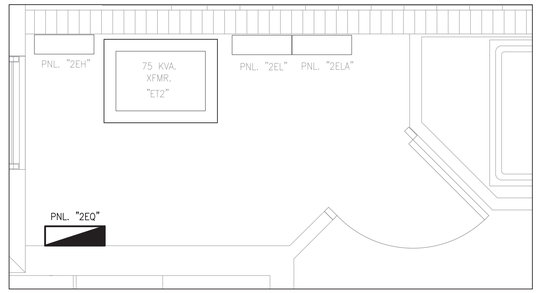


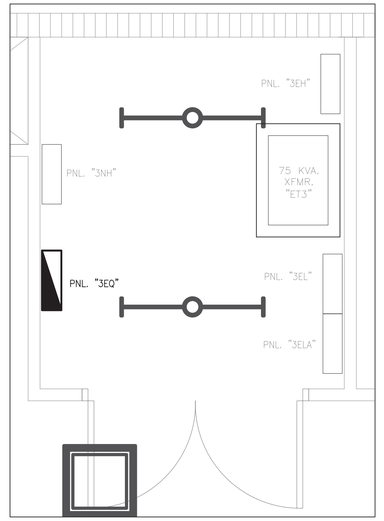
FIRST FLOOR MAIN ELECTRICAL ROOM

SCALE: 1/2"= 1'-0"



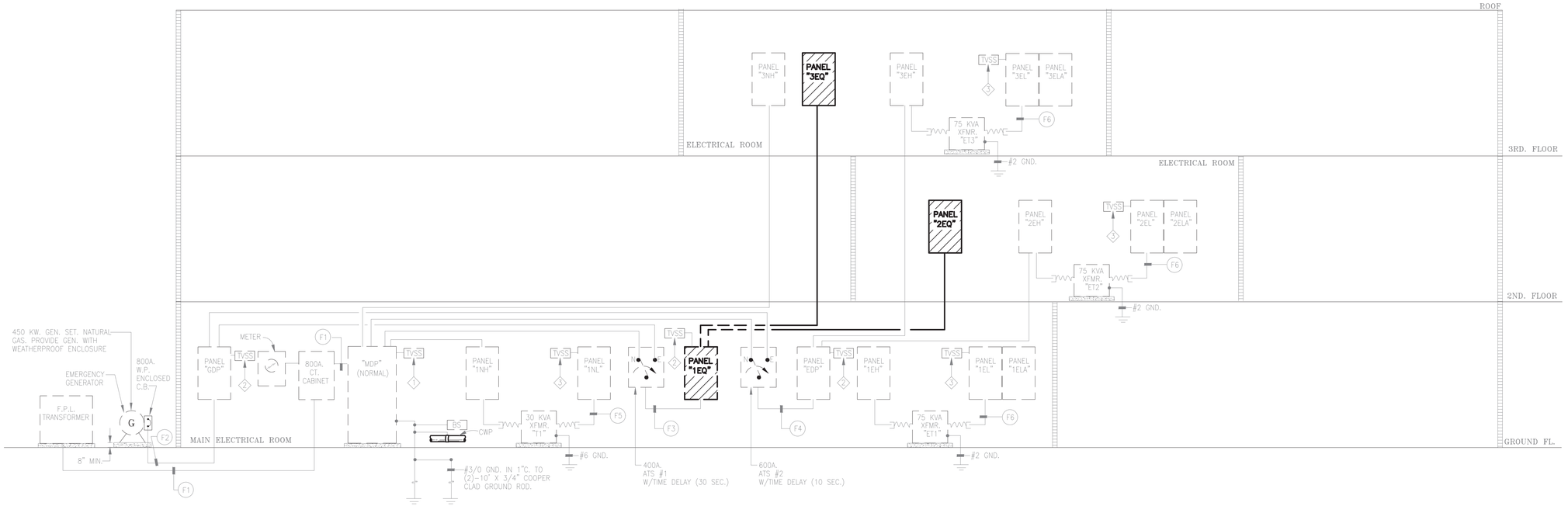
SECOND FLOOR ELECTRICAL ROOM

SCALE: 1/2"= 1'-0"



THIRD FLOOR ELECTRICAL ROOM

SCALE: 1/2"= 1'-0"



EXISTING ELECTRICAL RISER DIAGRAM

SCALE: N.T.S.

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
FIELD BOOK:
DATE: Oct. 26, 16
SCALE: AS SHOWN

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ELECTRICAL RISER DIAGRAM &
ELECTRICAL ROOM LAYOUT
528 NW 2ND STREET

BID SET

SHEET NO. E07 OF 07

TOTAL: 07

CAD FILE: 12200-MULTI-ELEC

DRAWING FILE NO. 4-140-05

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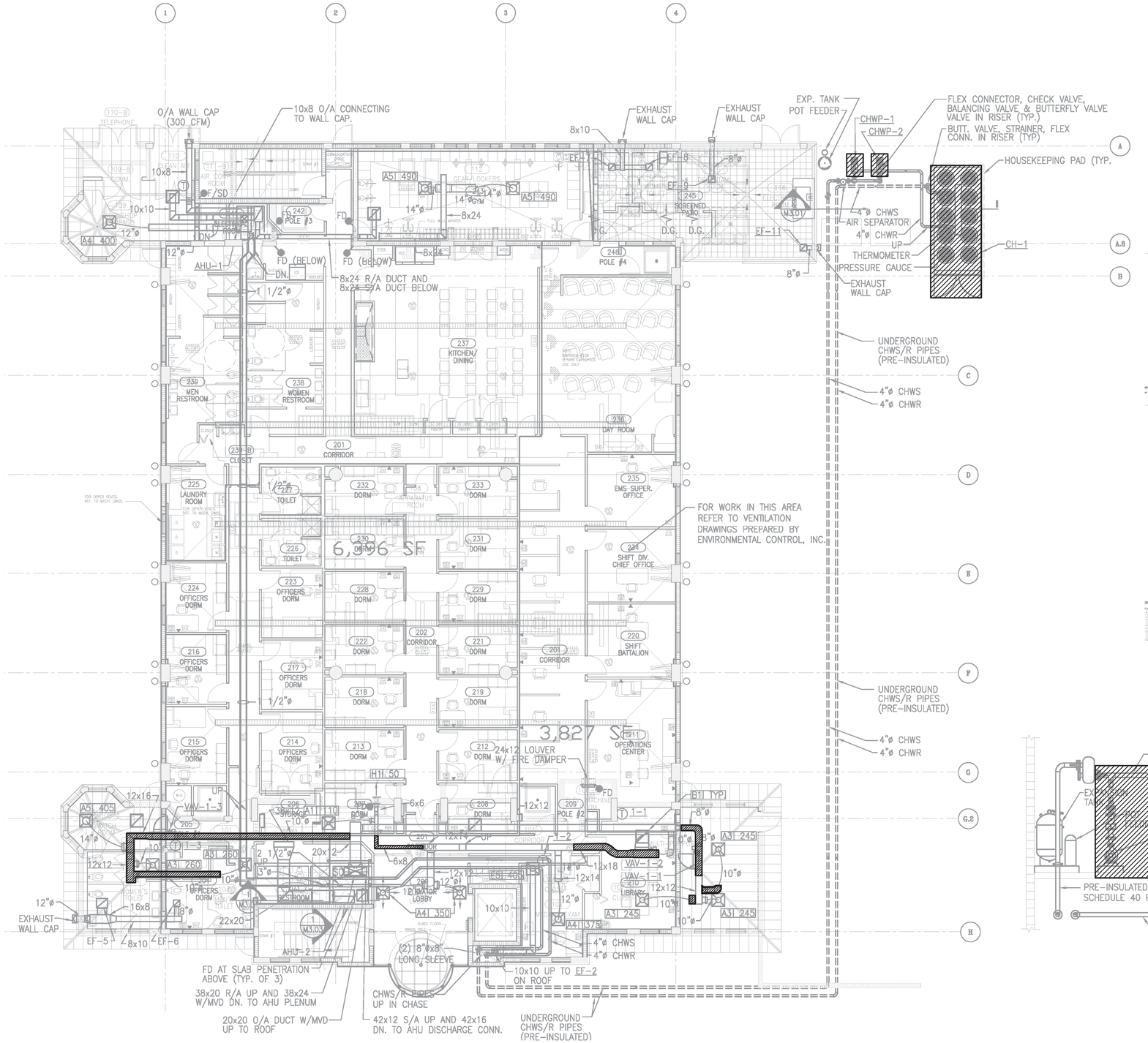
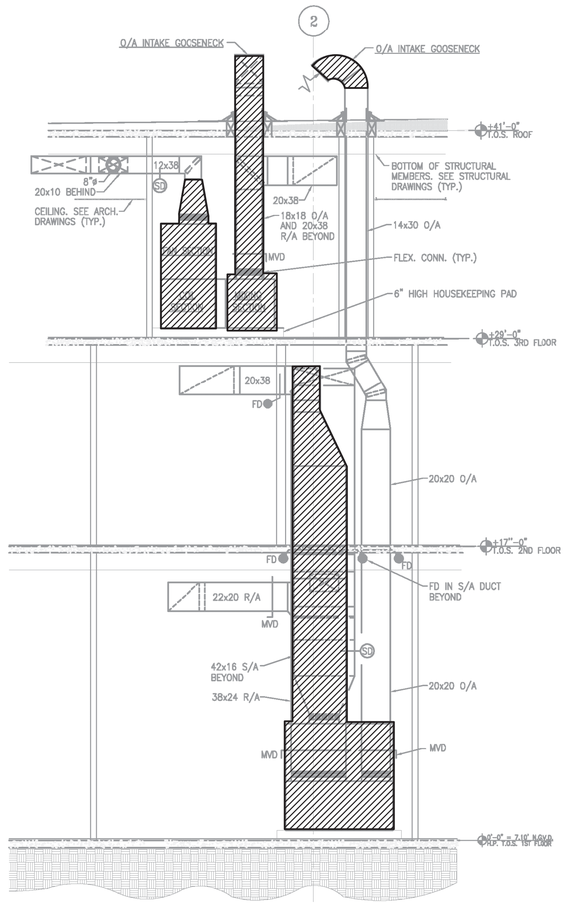


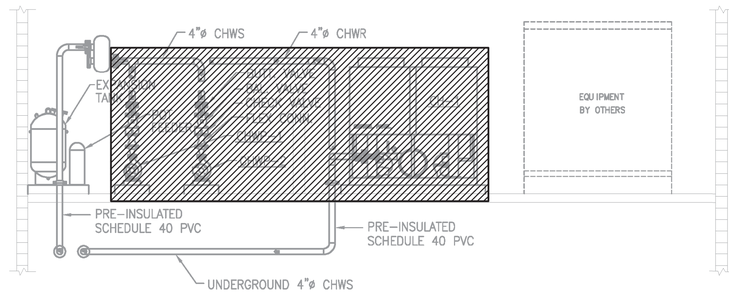
EXISTING FIRST FLOOR DEMOLITION PLAN

SCALE:1/8"=1'-0"



EXISTING SECTION

SCALE:1/4"=1'-0"



EXISTING SECTION

SCALE:1/4"=1'-0"

LEGEND

DEMO

EXISTING TO REMAIN

BID SET

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL. (954) 828-9069
FAX. (954) 828-3976

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Nov. 2, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
FIRST FLOOR HVAC
DEMOLITION & CLEANING PLAN
528 NW 2ND STREET

SHEET NO. M01 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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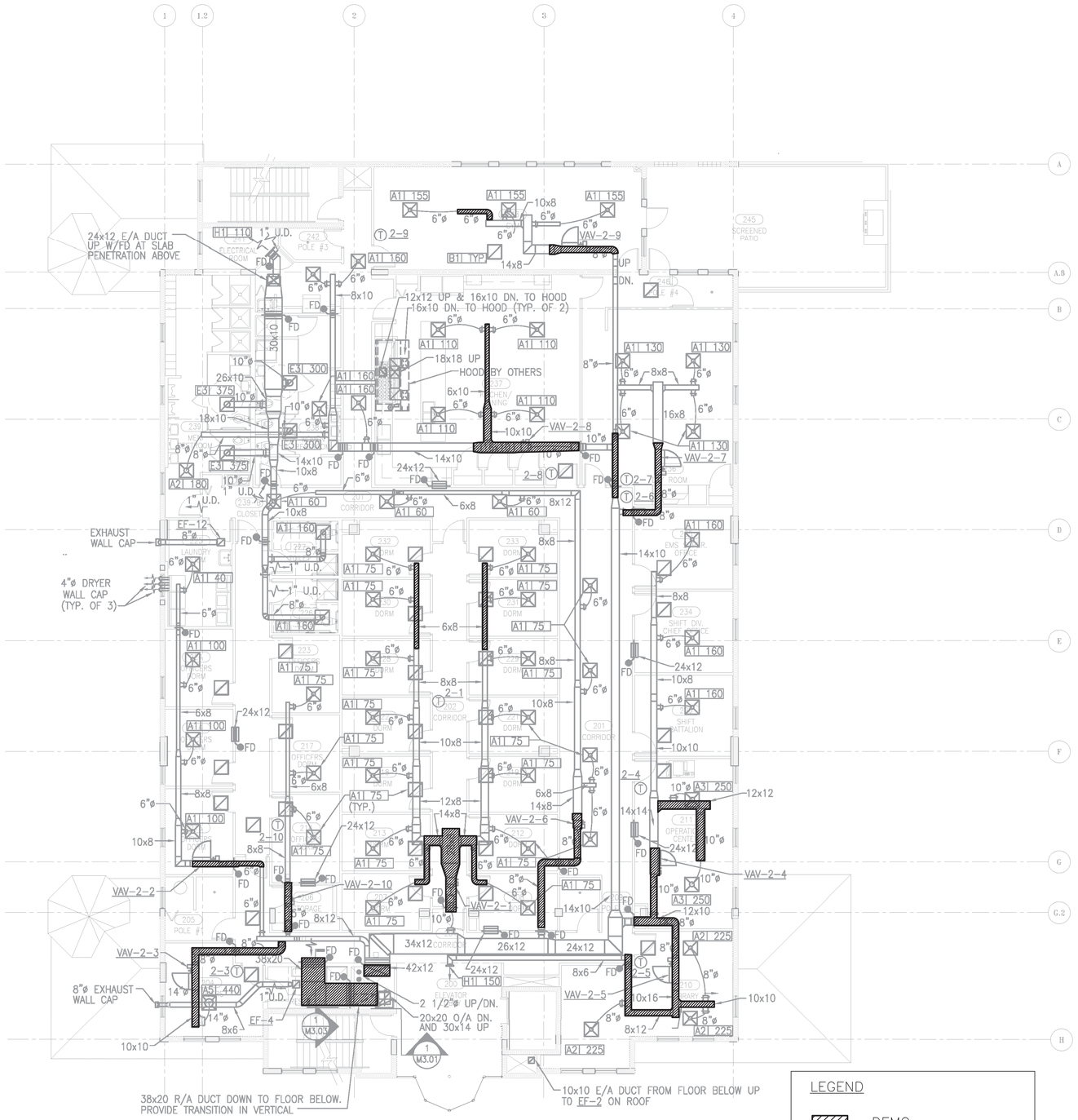

SECOND FLOOR DEMOLITION & CLEANING PLAN

SCALE:1/8"=1'-0"

HVAC NOTES:

A–A/C:

1. AFTER PARTIAL DEMOLITION, THE REMAINING DUCT WORK NEED TO BE BRUSH VACUUM CLEAN, THEN SANITIZED WITH APPROVED ANTI– BACTERIAL, MOLD, AND FUNGUS AGENT. IF THE ACCESS TO DUCT –INSIDE IS NOT ENOUGH. THE CONTRACTOR SHALL MAKE AN ACCESS OF 12"X10" AT THE BOTTOM OF THE DUCT FOR CLEANING. CONTRACTOR SHALL RECEIVE $100 FOR EACH OPENING, REPAIR TO ORIGINAL CONDITION WITHOUT AIR LEAK WRITTEN APPROVAL OF ENGINEER IS REQUIRED BEFORE CUTTING.

2. NEW DUCT WORK MIGHT PASS THROUGH FIRE RATED WALL. CONTRACTOR SHALL FURNISH AND INSTALL FIRE DAMPER AT WALL OPENING PER FLORIDA BUILDING CODE. WRITTEN APPROVAL OF ENGINEER IS REQUIRED BEFORE INSTALLATION. CONTRACTOR SHALL RECEIVE $150 PER INSTALLED FIRE DAMPER.

3. THE HORIZONTAL AHUS WILL BE INSTALLED IN DROP CEILING PER DETAIL DRAWING. THE DETAIL OF VERTICAL AHUS IS NOT GIVEN DUE TO CHANGES AND FINDING DURING DEMOLITION. VERTICAL AHUS SHALL HAVE AUXILIARY DRAIN PAN WITH DIMENSION 2 ½ " LARGER THAN AHU AT ALL SIDES. A LAYER OF ½" NEOPRIN 60 AND SAME DIMENSION OG DRAIN PAN SHALL BE INSTALLED BETWEEN FLOOR SLAB AND DRAIN PAN, AND ½" NEOPRIN VIBRATION INSULATION PAD 60 SHALL BE REPLACED BETWEEN AHU AND DRAIN PAN.

4. THE CONNECTION OF AHUS TO DUCT WORK SHALL BE BY NON–METALIC FLEXIBLE CANVAS CONNECTION.

5. CONDENSATE WATER PIPING FROM AHUS TO EXISTING CONDENSATE DRAIN ARE 1 ¼" O.D. PVC SCHE 40 WITH ½" ARMO FLEX INSULATION. CONDENSATE DRAIN PIPES ARE NOT SHOWN BUT CONTRACTOR SHALL INCLUDE IN THIS BID.

6. ALL INSIDE AHUS SHALL HAVE INTEGRATED STRIP HEATER 4.5KW/480V/277V/3PHASE, 2 STAGE AT 2.25 KW/STAGE.

7. CONTROLS:
   a–AHUS:
   - a1– IN SLEEPING AREA AND AREA IN 24 HOUR USE, THE AHUS FAN SHALL RUN CONTINUOUSLY. THE TEMPERATURE CONTROL SHALL BE BY A MODULATING VALVE TO CHANGE THE FLOW OF CHILLED WATER.
   - a2– AHU'S IN OFFICES, THE AREAS THAT ARE USED IN WORKING HOURS (8HRS OR MORE), THE TEMPERATURE CONTROL SHOULD BE WITH THE THERMOSTAT ON AIR FLOW AND COLD WATER.
   - a3– THERMOSTATS WILL SENSE RETURN AIR TEMPERATURE. THEY SHOULD BE INSTALLED NEAR UNIT'S RETURN GRILLS AT A DISTANCE LESS THAN 5 FEET. CONTRACTOR TO VERIFY EXACT LOCATION WITH FIRE DEPARTMENT.
   - a4– OUT–SIDE AIR UNIT CONTROL, IS BY CHANGE OF DISCHARGED CFM. PRESSURE DIFFERENTIAL BETWEEN IN–SIDE & OUT–SIDE OF THE BUILDING. THROUGH A TRANSDUCER WILL ACT ON VFD OF FAN MOTOR. BUILDING MUST BE IN POSITIVE PRESSURE OF 0.02 TO 0.05 INCH OF WATER GAUGE ALL THE TIME.

   b–CHILLED WATER & CHILLER CONTROL:
   CHILLED WATER SYSTEM HAS FOUR IDENTICAL CHILLED–WATER–SUPPLY PUMPS CONNECTED IN PARALLEL. IN CHW RETURN PIPE THERE ARE FOUR TEMPERATURE SENSORS THAT ARE ADJUSTED TO 52°F, 54°F, 56°F, & 58°F. THAT START THE PUMPS. AT PARTIAL LOAD ONLY PUMP #1 RUNS AND AT FULL LOAD ALL THREE PUMPS ARE RUNNING. PUMP #4 IS STAND BY.

8. A SET OF DIFFERENTIAL PRESSURE SENSORS LOCATED IN CHILLED WATER SUPPLY AND CWR (NEAR CHILLERS ON MAIN CWS & CWR PIPES), SO THEY CAN SENSE THE WATER FLOW AT MINIMUM, AND SHUT DOWN THE CHILLERS.

9. EXHAUST FAN:
   ALL NEW EXHAUST FANS ARE CEILING MOUNTED, AND POWERED FROM LIGHTING CIRCUITS THROUGH A MOTION SENSOR ADJUSTED 20 MINUTES FOR WOMEN BATHROOM AND 15 MINUTES FOR MEN BATHROOM, PER DETAIL WIRING DIAGRAM ON PAGE E05.

10. ELECTRICAL:
    THE EXISTING CIRCUITS THAT SUPPLY POWER TO EXISTING VAVS SHALL BE USED TO POWER NEW AHUS. THOSE CIRCUITS ARE SINGLE PHASE WITH 3X#12. THOSE CIRCUITS MUST BE UPGRADED TO THREE PHASED WITH 5X#12 IN EXISTING CONDUITS.

11. INCASE OF DISCREPANCY BETWEEN SPECIFICATION AND DRAWING THE INFORMATION OF DRAWING MUST BE CONSIDERED.

DEMOLITION & CLEANING NOTES:

1. THE HATCHED AREAS ARE THE LOCATIONS THAT EXISTING A/C DUCTS SHALL BE DEMOLISHED AND HAULED AWAY FROM SITE.

2. ALL EXISTING A/C GRILLS SHALL REMAIN IN THEIR LOCATION.

3. ALL FLEXIBLE DUCTS SHALL BE REMOVED AND DISPOSED OF OFF SITE.

4. AFTER DEMOLITION IS COMPLETED THERE WILL BE ENOUGH DUCT OPENINGS TO ACCESS DUCT'S INTERIOR FOR CLEANING, HOWEVER IN A FEW LOCATIONS WHERE THE OPENINGS ARE FAR FROM EACH OTHER THE CONTRACTOR SHALL MAKE AN APPROPRIATE OPENING FOR CLEANING THE DUCTS. THE LOCATION OF THOSE OPENINGS, SHALL BE APPROVED BY ENGINEER BEFORE CUTTING. AFTER CLEANING IS COMPLETED, THOSE OPENINGS SHALL BE SEALED WITH SAME GAGE SHEET METAL AND OVER LAPPED MINIMUM OF 1 ½" AT ALL SIDES WITH SET SCREW SPACING 4" O.C–AND LEAK TIGHT WITH MEMBRANE AND DUCT MASTIC.

5. THE NEEDED LOCATIONS AND THE NUMBER OF THOSE OPENINGS MUST BE APPROVED BY ENGINEER OF RECORD PRIOR TO WORK.

6. THE DUCTS INSIDE SHALL BE BRUSHED, VACUUMED, THEN SANITIZED WITH AN ANTI–BACTERIAL SUBSTANCE APPROVED BY ENGINEER OF RECORD.

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828–5059
FAX: (954) 828–5074

DRAWN BY: BH
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FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
2ND FLOOR HVAC
DEMOLITION & CLEANING PLAN
528 NW 2ND STREET

BID SET

SHEET NO. M02 OF 13

TOTAL: 13

CAD FILE: 12200–MULTI–MECH

DRAWING FILE NO. 4–140–05

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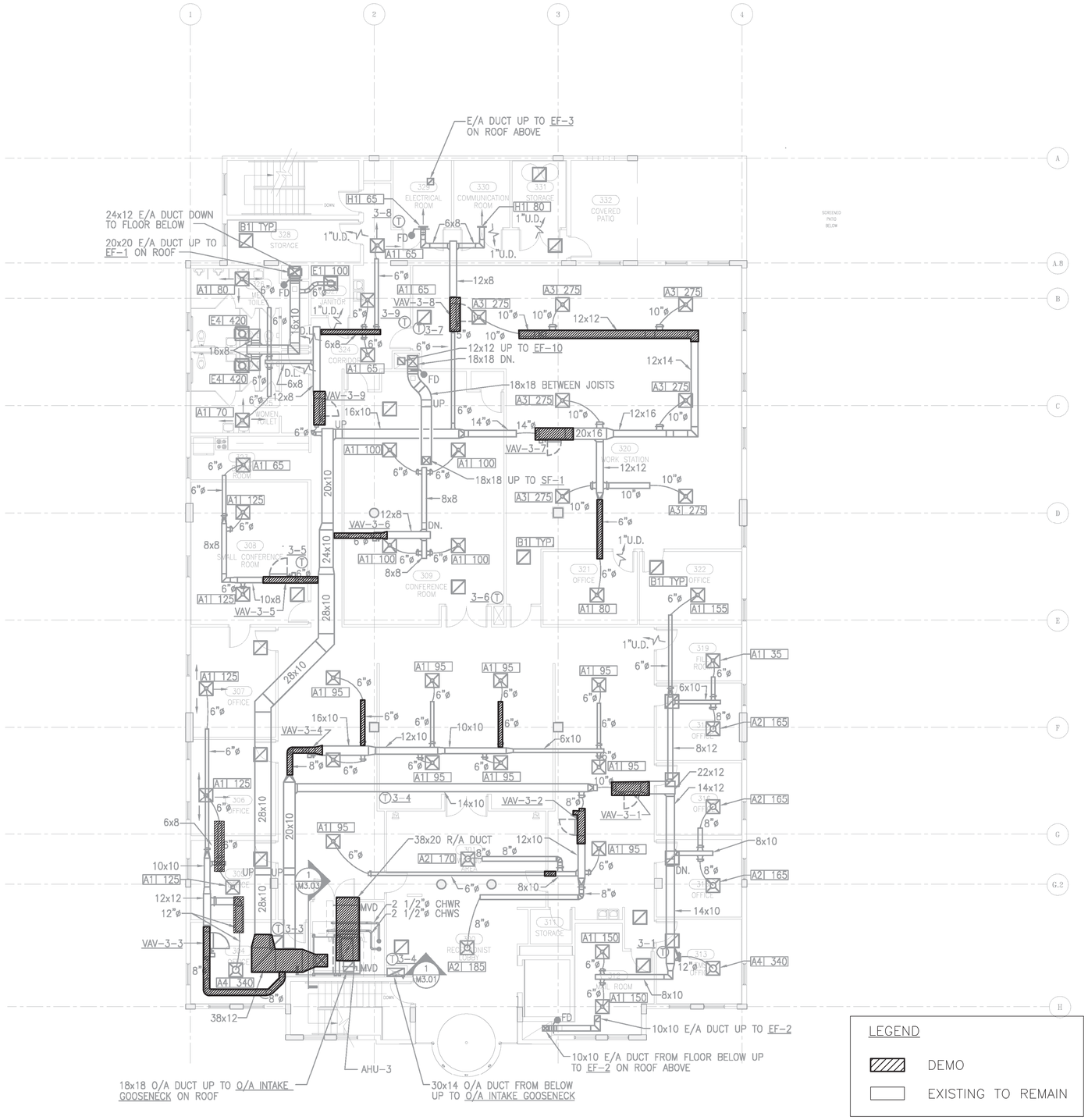
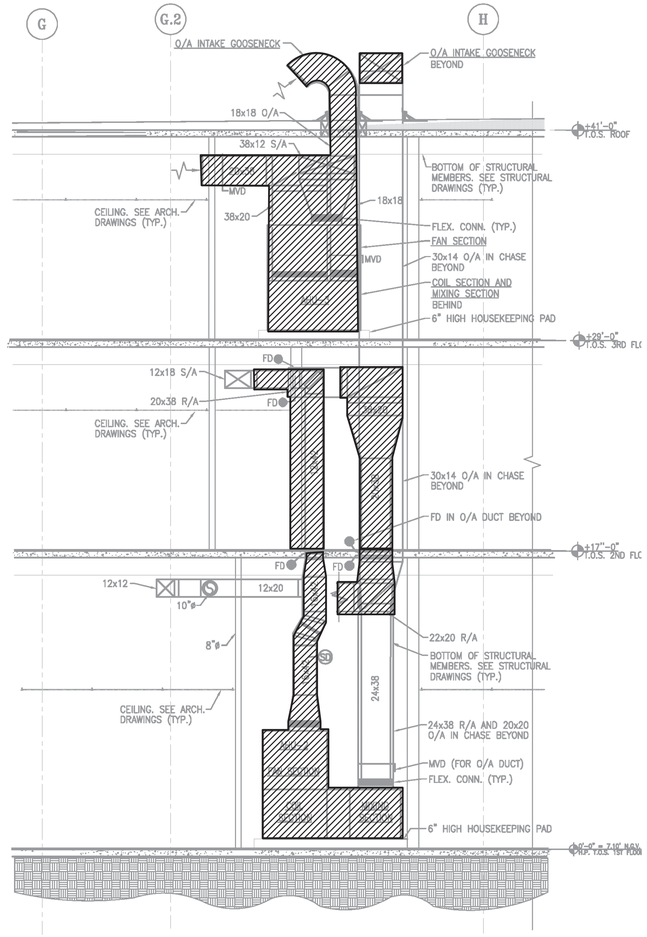


THIRD FLOOR DEMOLITION & CLEANING PLAN

SCALE: 1/8"=1'-0"



EXISTING SECTION

SCALE: 1/4"=1'-0"

LEGEND

- DEMO
- EXISTING TO REMAIN

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
3RD FLOOR HVAC
DEMOLITION & CLEANING PLAN
528 NW 2ND STREET

BID SET

SHEET NO. M03 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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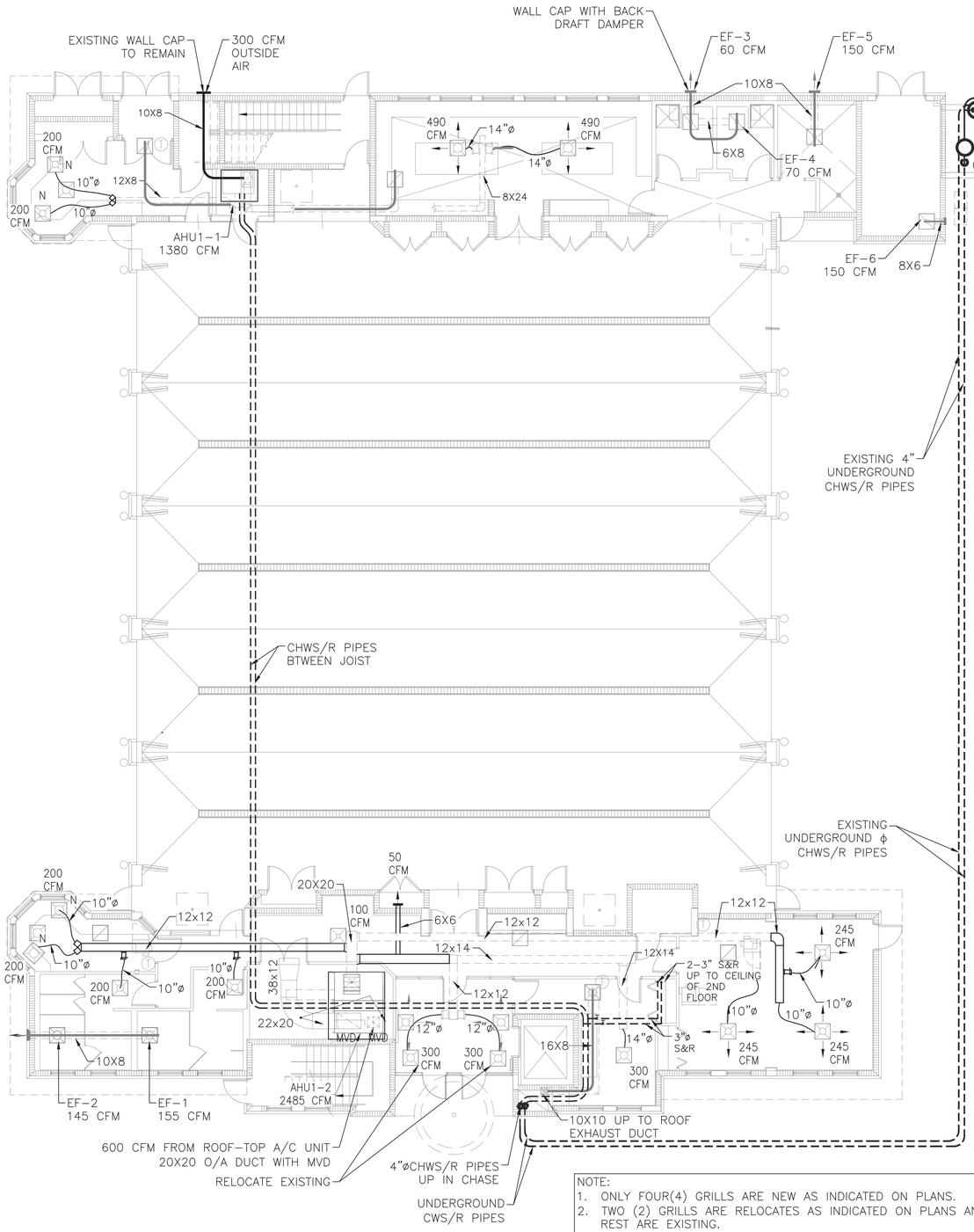

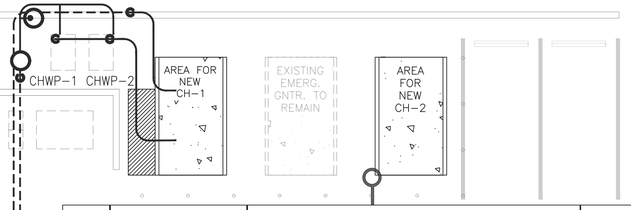

BUILDING AIR VENTILATION OUTSIDE AIR SUPPLY & EXHAUST

ITEMS	DESCRIPTION	OUTSIDE-AIR REQUIRED & SUPPLY				EXHAUST AIR FROM BUILDING BY FAN "CFM"			EXCESS O.S. AIR FOR POSITIVE PRESSURE			SOURCE
		OUTSIDE AIR REQUIRED "CFM"			OUTSIDE AIR SUPPLIED "CFM"	FANS						O.S. AIR
		NO. OF PEOPLE	O.S. AIR PER PERSON "CFM"	TOTAL REQUIRED O.S. AIR "CFM"		NO. OF FANS	FAN'S IDENTIFICATIONS	TOTAL AIR EXAUST CFM	NO FAN RUNNING CFM	ALL FANS RUNNING CFM	60% FANS RUNNING CFM	SUPPLY
1	FIRST FLOOR-WEST SIDE OCCUPANCY	20	25	500	600	3	EF-1+EF-2+EF-MEDICAL	520	600	80	288	ROOF-TOP O.S. AIR UNIT
2	FIRST FLOOR-EAST SIDE OCCUPANCY	12	25	300	300	3	EF-3+EF-4+EF-5, (EF-6)*	280	300	20	132	WALL CAP THROUGH UNIT #1
3	2ND FLOOR-HOOD RUNS OCCUPANCY	50	25	1250	1500	10	EF-7+EF-8+EF-9+EF-10+EF-11+ EF-12+EF-13+EF-14+EF-15+EF-16	1130	1320	190	642	ROOF-TOP O.S. AIR UNIT
4	2ND FLOOR-HOOD IS OFF OCCUPANCY	50	25	1250	1500	10	EF-7+EF-8+EF-9+EF-10+EF-11+ EF-12+EF-13+EF-14+EF-15+EF-16	1130	1500	370	822	ROOF-TOP O.S. AIR UNIT
5	3RD FLOOR OCCUPANCY	40	25	1000	1000	4	EF-17+EF-18+EF-19+EF-20	580	1000	420	652	ROOF-TOP O.S. AIR UNIT

*EF-6 IS IN ELECTRICAL ROOM, NON-AIR CONDITIONED SPACE

LEGEND

- N NEW GRILL
- EXISTING GRILL
- NEW DUCT
- EXISTING TO REMAIN

ROOF TOP OUTSIDE AIR UNIT SELECTION:

DESIGN CONDITIONS:
1. OUTSIDE AIR: DRY BULB TEMPERATURE = 95°F, WET BULB TEMPERATURE = 78°F
2. INDOOR AIR: D.B. TEMPERATURE = 75°F, W.B. TEMPERATURE = 59.7°F, RH = 55%
3. ENTHALPY OF OUTSIDE AIR: H_0 = 41.5 BTU/LB OF O.S. DRY AIR
4. ENTHALPY OF INSIDE AIR: H_i = 29.4 BTU/LB OF INSIDE AIR, TO BRING THE OUTSIDE AIR CONDITION TO INSIDE AIR CONDITION, WE MUST LOWER THE OUTSIDE AIR ENTHALPY TO THE INSIDE AIR ENTHALPY.
$Q_{o.s.}-Q_{i.s.}$ = $M_{MASS\ AIR}$ X $(H_{o.s.}-H_{i.s.})$ = 60 MINX0.075 LB/FT³ X CFM $(H_{o.s.}-H_{i.s.})$ = 4.5 CFM $(H_{o.s.}-H_{i.s.})$
5. THE MAXIMUM CFM OF O.S. AIR UNIT IS (600+1,500+1,000) = 3,100 CFM
6. ΔQ = $(Q_{o.s.}-Q_{i.s.})$ = 4.5X3,100X(41.5-29.4) = 170,190 BTU/HR
7. UNIT TONNAGE = 170,190/12,000 = 14.18 TONS (SELECT A 14 TON UNIT)
8. CHILLED WATER: GPM = 14TONS X 2.4 = 34 GPM CHILLED WATER WITH DT=10°F
9. SUPPLY CHILLED WATER & RETURN CHILLED WATER PIPING: 2" PRE-INSULATED PIPES
10. UNIT OF 08-39LA WITH 6 ROW COIL WAS SELECTED (420 FPM AIR FLOW)
11. UNIT SHALL DRIVE WITH VFD, & VFD SHALL BE ADJUSTED WITH PRESSURE DIFFERENTIAL OF 0.05 TO 0.015 INCHES OF WATER BETWEEN OUTSIDE AIR AND INSIDE AIR OF THE BUILDING.

NOTE:
1. ONLY FOUR(4) GRILLS ARE NEW AS INDICATED ON PLANS.
2. TWO (2) GRILLS ARE RELOCATES AS INDICATED ON PLANS AND ALL THE REST ARE EXISTING.
3. ALL EXHAUST FANS ARE NEW PER SCHEDULE.
4. DASHED DUCTS ARE EXISTING & TO BE REUSED.
5. SOLID DUCTS ARE NEW TO BE FURNISHED & INSTALLED BY CONTRACTOR.

OUTSIDE AIR & EXHAUST FIRST FLOOR PLAN

SCALE:1/8"=1'-0"

FAN SCHEDULE						
FIRST FLOOR						
UNIT DESIGNATION	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6
SERVING AREA	1ST FL. MEN'S BEDROOM NW CORNER	1ST FL. WOMEN'S BEDROOM NW CORNER	1ST FL. MEN'S BATHROOM SE CORNER	1ST FL. WOMEN'S BATHROOM SE CORNER	1ST FL. DECONTAM. ROOM SE CORNER	1ST FL. ELECT. ROOM SE CORNER
REQUIRED SERVICE	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST
LOCATION	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING
FAN TYPE	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL
FAN WHEEL TYPE	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT
TOTAL AIR CPM (DESIGN)	155	145	60	70	150	150
CFM AT 0.1" W.G.S.P.	161 AT 0.1"	161 AT 0.1"	80 AT 0.1"	80 AT 0.1"	161 AT 0.1"	161 AT 0.1"
FAN SPEED (RPM, MAX)	710	710	-	-	710	710
FAN MOTOR HP RATED	1/16 (100W)	1/6 (100W)	12W	12W	1/6 (100W)	1/6 (100W)
FAN BRAKE HP	0.134 HP	0.125 HP	0.016 HP	0.016 HP	0.13 HP	0.13 HP
ELECTRICAL POWER V/PHASE/HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ
FAN SPEED CONTROL	4C331 OR 6E897	4C331 OR 6E897	V. CHANCE	V. CHANCE	4C331 OR 6E897	4C331 OR 6E897
RATED AMPS	1.3 AMPS	1.3 AMPS	0.1 AMPS	0.1 AMPS	1.3 AMPS	1.3 AMPS
HOUSING DIMENSIONS (W"X L"X H")	12¼X12¼X11¼	12¼X12¼X11¼	11¼X10½X7¾	11¼X10½X7¾	12¼X12¼X11¼	12¼X12¼X11¼
CEILING GRILL (L" X W")	14X14	14X14	14X13	14X13	14X14	14X14
SOUND LEVEL Dba at....S.P.	1.4 AT 0.1" S.P.	1.4 AT 0.1" S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.	1.4 AT 0.1" S.P.	1.4 AT 0.1" S.P.
ACCESSORIES	①②⑨	①②⑨	①②⑨	①②⑨	①②⑤	①②⑩
REMARKS						⑩
DESIGN: MODEL	L-150 (2)	L-150 (2)	XB80 (1)	XB80 (1)	L-150 (2)	L-150 (2)
MANUFACTURER	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN
ITEM NO.:	4TR44	4TR44	22CV87	22CV87	4TR44	4TR44

ACCESSORIES & REMARKS:
① SOLID STATE SPEED CONTROL
② BACK DRAFT DAMPER
③ SERVICE FACTOR 1.15 "FOR ALL"
④ RUN CONTINUOUSLY
⑤ SERIVCE DISCONNECT SWITCH
⑥ MOTOR RATE SWITCH
⑦ ROOF CURB
⑧ PRE-FABRICATED BY MANUFACTURER
⑨ POWERED THROUGH LIGHT CIRCUIT PER DETAIL ON SHT. M05
⑩ POWER THROUGH THERMOSTAT, TURN-ON AT 85°F & HIGHER TEMPERATURE
⑪ EXISTING TO BE REPLACED BY MUSHROOM AIR VENT
⑫ SEE M05.
⑬ ALL BATHROOM FAN WILL BE POWERED BY LIGHT CIRCUIT, PER DETAIL ON SHT. M05.

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Nov. 2, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
1ST FLOOR HVAC
OUTSIDE AIR & EXAUST PLAN
528 NW 2ND STREET

BID SET

SHEET NO. M04 OF 13
TOTAL: 13
CAD FILE: 12200-MULTI-MECH
DRAWING FILE NO. 4-140-05

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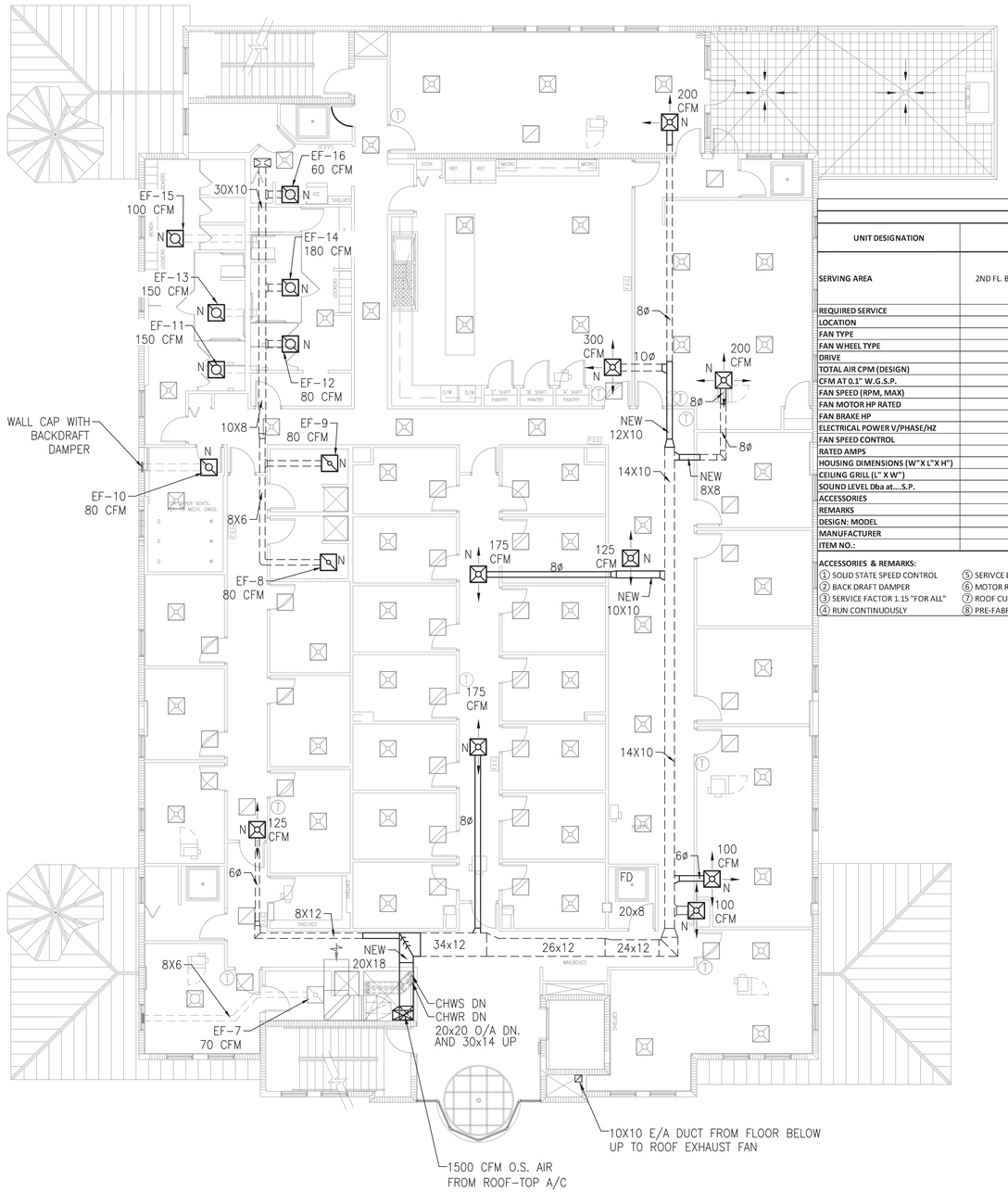


OUTSIDE AIR & EXHAUST SECOND FLOOR PLAN

SCALE:1/8"=1'-0"

FAN SCHEDULE

SECOND FLOOR

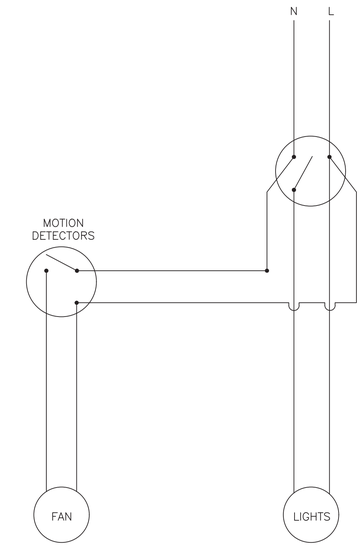
UNIT DESIGNATION	EF-7	EF-8	EF-9	EF-10	EF-11	EF-12	EF-13	EF-14	EF-15	EF-16
SERVING AREA	2ND FL. BATH ROOM NW CORNER	2ND FL. HANDICAP BATH N. CENTER	2ND FL. HANDICAP BATH N. CENTER	2ND FL. LAUNDRY N. CENTER	2ND FL. MEN'S BATHROOM NE CORNER	2ND FL.WOMEN'S BATHROOM NE CORNER	2ND FL. MEN'S BATHROOM NE CORNER	2ND FL.WOMEN'S SHOWER NE CORNER	2ND FL. MEN'S SHOWER NE CORNER	2ND FL. JANITOR'S SINK NE CORNER
REQUIRED SERVICE	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST
LOCATION	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING	CEILING
FAN TYPE	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL
FAN WHEEL TYPE	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT
TOTAL AIR CPM (DESIGN)	70	80	80	80	150	180	150	180	100	60
CFM AT 0.1" W.G.S.P.	80 AT 0.1"	80 AT 0.1"	80 AT 0.1"	80 AT 0.1"	161 AT 0.1"	214 AT 0.1"	161 AT 0.1"	214 AT 0.1"	110 AT 0.1" S.P.	80 AT 0.1" S.P.
FAN SPEED (RPM, MAX)	-	-	-	-	710	740	710	740	-	-
FAN MOTOR HP RATED	12W	12W	12W	12W	1/6 (100W)	1/6 (127W)	1/6 (100W)	1/6 (100W)	24W	12W
FAN BRAKE HP	0.016 HP	0.016 HP	0.016 HP	0.016 HP	0.13 HP	0.195 HP	0.13 HP	0.195 HP	0.03 HP	0.016 HP
ELECTRICAL POWER V/PHASE/HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ
FAN SPEED CONTROL	V. CHANCE	V. CHANCE	V. CHANCE	V. CHANCE	4C331 OR 6E897	4C331 OR 6E897	4C331 OR 6E897	4C331 OR 6E897	V-REDUCTION	V-REDUCTION
RATED AMPS	0.1 AMPS	0.1 AMPS	0.1 AMPS	0.1 AMPS	1.3 AMPS	1.8 AMPS	1.3 AMPS	1.8 AMPS	0.2 AMPS	0.1 AMPS
HOUSING DIMENSIONS (W"X L"X H")	11¾X10½X7¾	11¾X10½X7¾	11¾X10½X7¾	11¾X10½X7¾	12¼X12¼X11¾	12¼X12¼X11¾	12¼X12¼X11¾	12¼X12¼X11¾	11¾X10½X7¾	12¼X12¼X11¾
CEILING GRILL (L" X W")	14X13	14X13	14X13	14X13	14X14	14X14	14X14	14X14	14X13	14X13
SOUND LEVEL Dba at....S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.	1.4 AT 0.1" S.P.	1.8 AT 0.1" S.P.	1.4 AT 0.1" S.P.	1.8 AT 0.1" S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.
ACCESSORIES	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨	①②⑨
REMARKS										
DESIGN: MODEL	XB80 (1)	XB80 (1)	XB80 (1)	XB80 (1)	L-150 (2)	L-200 (2)	L-150 (2)	L-200 (2)	XB110 (1)	XB80 (1)
MANUFACTURER	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN	BROAN
ITEM NO.:	22CV87	22CV87	22CV87	22CV87	4TR44	4TR48	4TR44	4TR48	22CV88	22CV87

ACCESSORIES & REMARKS:

① SOLID STATE SPEED CONTROL
② BACK DRAFT DAMPER
③ SERVICE FACTOR 1.15 "FOR ALL"
④ RUN CONTINUOUSLY
⑤ SERIVCE DISCONNECT SWITCH
⑥ MOTOR RATE SWITCH
⑦ ROOF CURB
⑧ PRE-FABRICATED BY MANUFACTURER
⑨ POWERED THROUGH LIGHT CIRCUIT, PER DETAIL ON SHT. M05.
⑩ POWER THROUGH THERMOSTAT, TURN-ON AT 85°F & HIGHER TEMPERATURE
⑪ EXISTING TO BE REPLACED BY MUSHROOM AIR VENT
⑫ U.L. LISTED GREASE TRAP, DRAIN CONNECTION VENTED ROOF CURB TO DISCHARGE 40" ABOVE ROOF PER NEPA-96 W/ SWITCH NEAR THE HOOD
⑬ ALL BATHROOM FAN WILL BE POWERED BY LIGHT CIRCUIT, PER DETAIL ON SHT. M05.

LEGEND

- NEW GRILL
- EXISTING GRILL
- NEW DUCT
- EXISTING TO REMAIN



DETAIL OF FAN POWER SUPPLY

SCALE: N.T.S.

BID SET

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
2ND FLOOR HVAC
OUTSIDE AIR & EXAUST PLAN
528 NW 2ND STREET

SHEET NO. M05 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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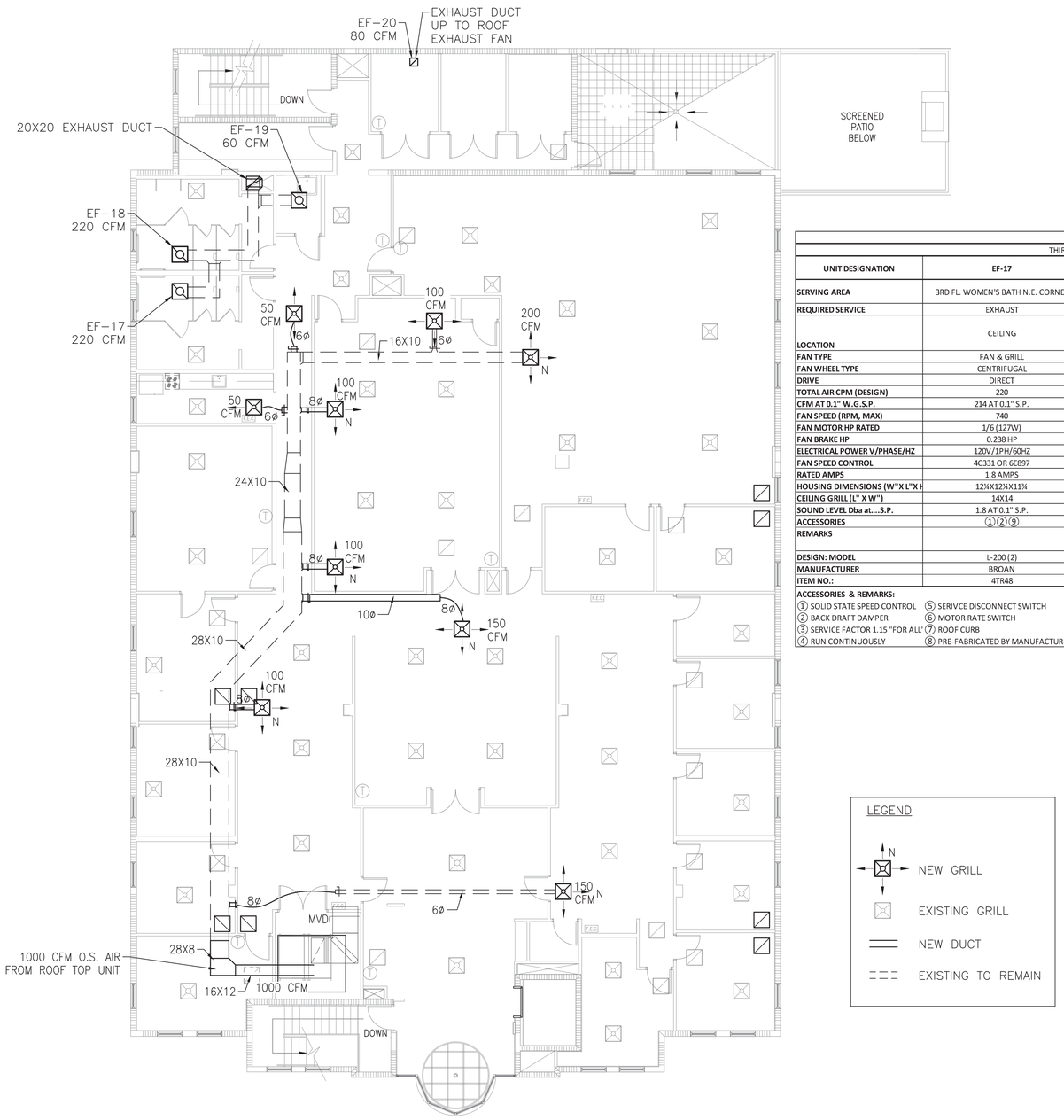

OUTSIDE AIR & EXHAUST THIRD FLOOR PLAN

SCALE:1/8"=1'-0"

FAN SCHEDLE

	THIRD FLOOR				EXISTING ROOF				
UNIT DESIGNATION	**EF-17**	**EF-18**	**EF-19**	**EF-20**	**EF-3**	**EF-1**	**EF-10**	**SF-1**	**EF-2**
SERVING AREA	3RD FL. WOMEN'S BATH N.E. CORNER	3RD FL. MEN'S BATH N.E. CORNER	3RD FL. JANITOR'S NE CORNER	3RD FL. ELEC ROOM CENTER	3RD FL. ELEC ROOM	3RD FL. BATH ROOM	2ND FL. HOOD	2ND FL. HOOD	1ST FL. MEDICAL RM.
REQUIRED SERVICE	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	EXHAUST	SUPPLY	EXHAUST
LOCATION	CEILING	CEILING	CEILING	CEILING	ROOF TOP VENTILATION CAP	ROOF TOP VENTILATION CAP	ROOF EXISTING	ROOF TOP TO BE ADJUSTED PER HOOD	ROOF TOP
FAN TYPE	FAN & GRILL	FAN & GRILL	FAN & GRILL	FAN & GRILL	EF-20	ROOF GRAVITY VENT-CAP	UP BLAST	FORWARD CURVED	DOWN BLAST
FAN WHEEL TYPE	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL	CENTRIFUGAL
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	DIRECT	BELT	BELT	BELT
TOTAL AIR CFM (DESIGN)	220	220	60	80	100	500	N/A	N/A	410
CFM AT 0.1" W.G.S.P.	214 AT 0.1" S.P.	214 AT 0.1" S.P.	80 AT 0.1" S.P.	80 AT 0.1" S.P.	524 AT 0.1" S.P.	1375 AT 0.1" S.P.	1800 AT 0.6" S.P.	1620 AT 0.25" S.P.	N/A
FAN SPEED (RPM, MAX)	740	740	N/A	N/A	N/A	N/A	1435	1105	1448
FAN MOTOR HP RATED	1/6 (127W)	1/6 (127W)	12W	12W	N/A	N/A	1/3	1/2	1/6
FAN BRAKE HP	0.238 HP	0.238 HP	0.016 HP	0.018 HP	0.018 HP	0.018 HP	0.36 HP	0.46 HP	N/A
ELECTRICAL POWER V/PHASE/HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ	120V/1PH/60HZ
FAN SPEED CONTROL	4C331 OR 6E897	4C331 OR 6E897	V-REDUCTION	V-REDUCTION	N/A	N/A	BELT & PULLY	BELT & PULLY	BELT & SHEAVE
RATED AMPS	1.8 AMPS	1.8 AMPS	0.1 AMPS	0.1 AMPS	N/A	N/A	2.6 AMPS	3.57 AMPS	1.3 AMPS
HOUSING DIMENSIONS (W"X L"X H	12¼X12¼X11¾	12X12X11¾	11⅝X10½X7⅝	11⅝X10½X7⅝	N/A	N/A	N/A	N/A	N/A
CEILING GRILL (L" X W")	14X14	14X14	14X13	14X13	N/A	N/A	N/A	N/A	N/A
SOUND LEVEL Dba at....S.P.	1.8 AT 0.1" S.P.	1.8 AT 0.1" S.P.	0.3 AT 0.1" S.P.	0.3 AT 0.1" S.P.	N/A	N/A	N/A	N/A	N/A
ACCESSORIES	①②⑨	①②⑨	①②⑨	①②⑩	CURB ADAPTURE REQUIRED	N/A	②⑫⑤	⑫⑤	②⑤
REMARKS					⑪	⑪	⑦⑧	⑦⑧	ADJUSTED TO 250 CFM
DESIGN: MODEL	L-200 (2)	L-200 (2)	X880 (1)	X880 (1)	LOW PROFILE GRAVITY VENT	LOW PROFILE GRAVITY VENT	135 VCR	90 KSP-B	80 ACE B
MANUFACTURER	BROAN	BROAN	BROAN	DAYTON	DAYTON	DAYTON	COOK	COOK	COOK
ITEM NO.:	4TR48	4TR48	22CV87	22CV87	2RB69	2RB71	N/A	N/A	N/A

ACCESSORIES & REMARKS:

① SOLID STATE SPEED CONTROL
② BACK DRAFT DAMPER
③ SERVICE FACTOR 1.15 "FOR ALL'
④ RUN CONTINUOUSLY
⑤ SERIVCE DISCONNECT SWITCH
⑥ MOTOR RATE SWITCH
⑦ ROOF CURB
⑧ PRE-FABRICATED BY MANUFACTURER
⑨ POWERED THROUGH LIGHT CIRCUIT, PER DETAIL ON SHT. M05.
⑩ POWER THROUGH THERMOSTAT, TURN-ON AT 85°F & HIGHER TEMPERATURE
⑪ EXISTING TO BE REPLACED BY MUSHROOM AIR VENT
⑫ U.L. LISTED GREASE TRAP, DRAIN CONNECTION VENTED ROOF CURB TO DISCHARGE 40" ABOVE ROOF PER NEPA-96 W/ SWITCH NEAR THE HOOD
⑬ ALL BATHROOM FAN WILL BE POWERED BY LIGHT CIRCUIT, PER DETAIL ON SHT. M05.

*TO BE ADJUSTED FROM 410 CFM TO 210 CFM

LEGEND

- NEW GRILL
- EXISTING GRILL
- NEW DUCT
- EXISTING TO REMAIN

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

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REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

BID SET

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
3RD FLOOR HVAC
OUTSIDE AIR & EXAUST PLAN
528 NW 2ND STREET

SHEET NO. M06 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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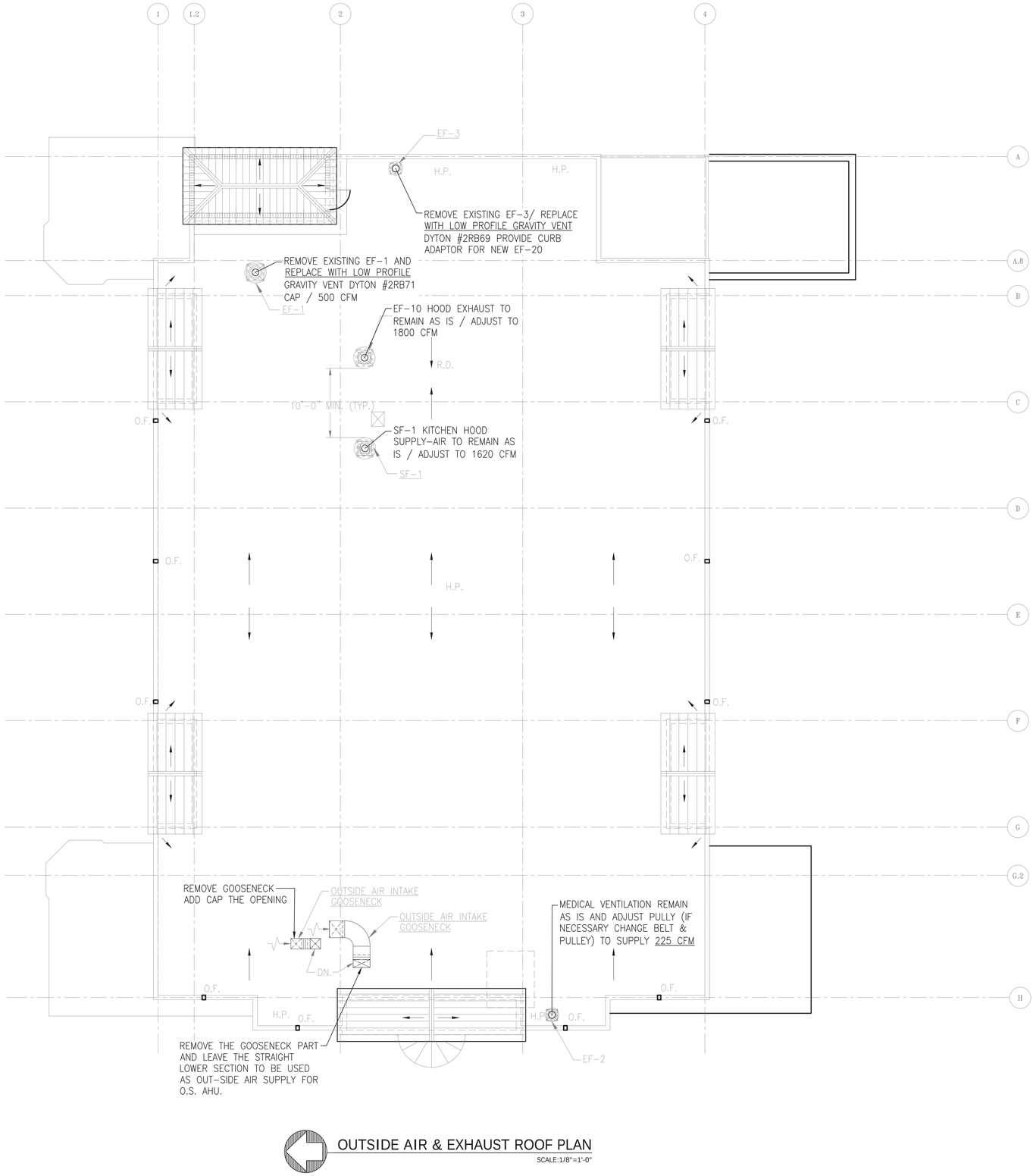
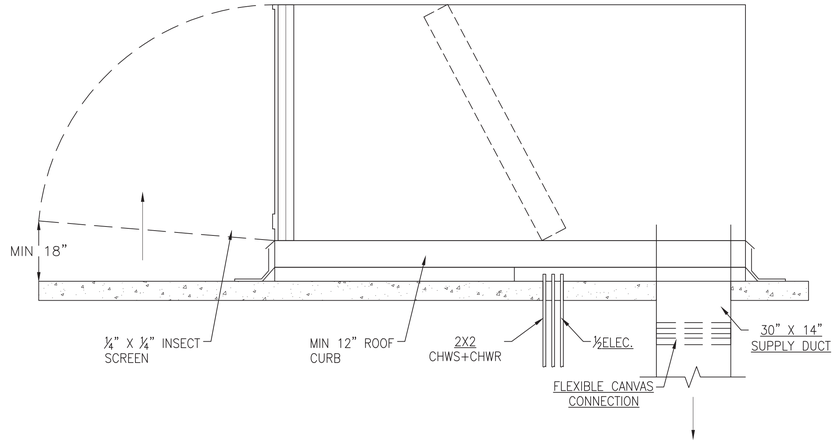


OUTSIDE AIR & EXHAUST ROOF PLAN

SCALE:1/8"=1'-0"

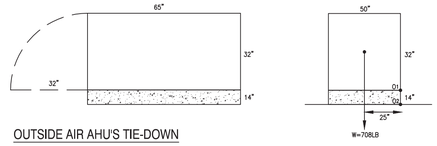


NOTES:

1. CONTRACTOR SHALL PROVIDE SUBMITTAL & DETAIL OF CONDENSATE DRAIN, ROOF ATTACHMENT INSTALLATION BEFORE WORK.
2. CALCULATIONS OF WIND LOADS PER LATEST EDITION OF FLORIDA BUILDING CODE SIGNED & SEALED BY PROFESSIONAL ENGINEER IS REQUIRED.

ROOF TOP AIR DETAIL

SCALE: N.T.S.



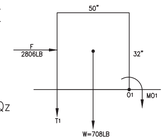
OUTSIDE AIR AHU'S TIE-DOWN

WIND LOAD CALCULATIONS:

PER: ASCE-7-10
DIMENSIONS: 65"X50"X32"
WET WEIGHT: 708LB
Qz = WIND VELOCITY PRESSURE IN LB/FT²
Qz = 0.00256XKz(I.V.)²
WHERE:
Kz = 0.99 FOR EXPOSURE 'C' AT ELEVATION 42'
I = IMPORTANCE FACTOR = 1.05
V = WIND VELOCITY OF 180 MPH
Qz = 0.00256X0.99(1.05X180)²
Qz = 90.53 LB/FT²

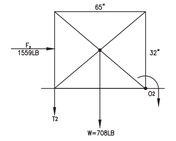
WIND PRESSURE ON OUTSIDE AIR UNIT

Pwind = Qz[(GCp)-(GCpi)]
WHERE:
GCp = 1.30
GCpi = +0.25
−0.25
PMAX = Qz[(1.30)-(−0.25)] = 1.55Qz
PMAX = 1.55X90.53 = 140.3LB/FT²
FWIND = PMAX X Aft²
Aft²(UNIT ONLY) = (65"X32"+804")/144=20FT²
FWIND = 140.3LB/FT²X20 = 2806LB
ΣO1 = 0
2806LBX16 = TX50"+708LBX25"
50"T1 = 27196
T1 = 27196/50 = 544LB



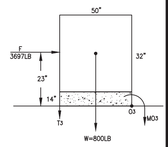
AHU'S TIE DOWN TO ROOF CURB

USE NO. 10 SET SCREW WITH ALLOWABLE PULL OUT FORCE OF 60LB
NO. OF SCREWS = 544/60 = 9.06 SCREWS
USE (10) SCREWS #10 & SPACING 6" C.TO C. TO TIE DOWN AHU'S FRAME TO ROOF CURB.
FWIND = 50"X32"X140.3/144 = 1559LB
ΣMO2 = 0
1559X16 = T2X65"+708X32.5
65T2 =1932
T2 = 30LB
MINIMUM (3) THREE #10 SET SCREW ALONG WIDTH OF AHU.



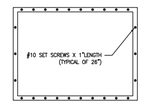
TIE DOWN OF ROOF CURB TO ROOF

FWIND = PMAX X Aft²
Aft² = (65"X46"+804")/144
Aft² = 26.35 FT²
F = 140.3LB/FT²X26.35 = 3697LB
ΣMO3 = 0
3697X23" = 800X25"+T3X50"
50T3 = 65031LB

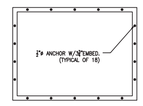


ROOF CURB TIE DOWN

ANCHOR BOLT OF ½"DIA. WITH EMBEDMENT OF 3¾" IN 3000PSI CONCRETE ROOF SLAB HAS PULLING FORCE OF 1,400LB, WITH SAFETY FACTOR 3.5. THE ALLOWABLE FORCE Is 400LB.
NO. OF ANCHORS = 1301LB/400LB = 3.25 BOLTS
USE OF MIN. OF FIVE ANCHORS ALONG 60" LENGTH OF CURB & (4) FOUR ANCHORS ALONG 50" SIDE OF CURB.



TIE DOWN AHU TO ROOF CURB



TIE DOWN ROOF CURB TO ROOF SLAB

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
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DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Nov. 2, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
ROOFTOP HVAC
OUTSIDE AIR & EXAUST PLAN
528 NW 2ND STREET

BID SET

SHEET NO. M07 OF 13
TOTAL: 13
CAD FILE: 12200-MULTI-MECH
DRAWING FILE NO. 4-140-05

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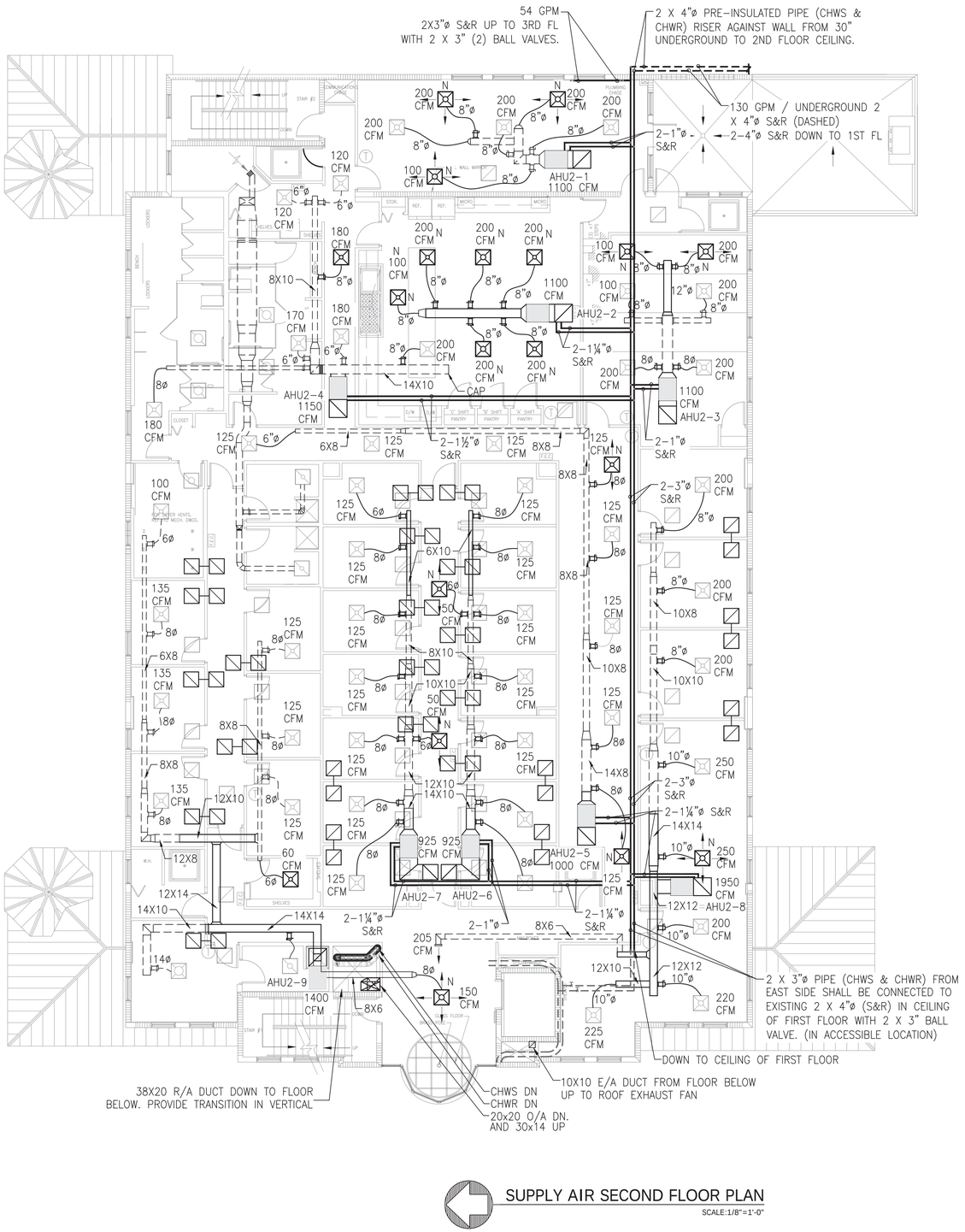

SUPPLY AIR SECOND FLOOR PLAN

SCALE:1/8"=1'-0"

DESIGN CHARACTERISTICS:

1. THIS PROJECT IS RETROFIT DESIGN TO EXISTING AIR CONDITIONING SYSTEM THAT DID NOT FUNCTION PROPERLY.
2. BUILDING WAS DESIGNED IN YEAR 2001.
3. BUILDING IS THREE STORY WITH HIGH RATIO OF SURFACE TO VOLUME, RESULTING IN HIGH COOLING AND HEATING LOSS.
4. THERMAL INSULATION WILL REMAIN ASBUILT IN 2003, AND IT IS NOT COMPLIANT WITH FBC ENERGY CONSERVATION SECTION AT 403.2.2 2014.
5. THIS BUILDING IS THE FIRE DEPARTMENT HEADQUARTERS AND IS OCCUPIED 24HRS A DAY, 7 DAYS A WEEK. AS EMERGENCY SITUATIONS INCREASE, IT'S OCCUPANCY WILL INCREASE. THEREFORE IT IS ESSENTIAL THAT THE A/C SYSTEM BE OPERATIVE AT ALL TIMES.
6. STAGED MULTIPLE COOLING UNITS SHOULD BE SELECTED INSTEAD OF A SINGLE UNIT.
7. UNITS SHOULD BE SELECTED WITH RESERVE CAPACITY IN SUCH THAT IF ONE COMPRESSOR IS DOWN FOR REPAIR THE SYSTEM CAN STILL OPERATE SUCCESSFULLY.
8. TWO IDENTICAL CHILLERS WITH CAPACITY OF 125% OF THE CALCULATED LOAD SHOULD BE SELECTED. EACH CHILLER WILL HAVE TWO COMPRESSORS WITH INDEPENDENT REFRIGERANT CIRCUITS AND TWO PUMPS.
9. DUE TO EXISTENCE OF COMBUSTIBLE MATERIAL, DROP CEILING SHALL NOT BE USED AS RETURN PLENUM.

NOTE:

1. THERE WILL BE SEVEN(7) NEW GRILLS ADDED.
2. TWENTY GRILLS IN THE SLEEPING UNITS WILL BE REPLACED WITH NEW 24"X24" LAY-IN GRILLS WITH 5/8" DIAMETER HOLE IN THE CENTER FACE OF GRILL FOR ADJUSTING THE DAMPER AND AIR FLOW (CFM) WITH AN ALLEN WRENCH. HOLE SHALL BE COVERED WITH A PLUG. THE GRILLS SHALL HAVE BUTTERFLY DAMPERS, ADJUSTABLE FROM GRILL FACE.
3. THE REMAINING GRILLS ARE EXISTING AND WILL REMAIN.
4. ALL EXISTING FLEXIBLE DUCTS MUST BE DISPOSED AND REPLACED WITH NEW FLEXIBLE DUCTS. PER NEW DRAWINGS.

LEGEND

- NEW GRILL
- EXISTING GRILL
- NEW DUCT
- EXISTING TO REMAIN

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:
TEL: (954) 828-5050
FAX: (954) 828-5074

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100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
2ND FLOOR HVAC
NEW SUPPLY DUCTS WITH AHU'S
528 NW 2ND STREET

BID SET

SHEET NO. M08 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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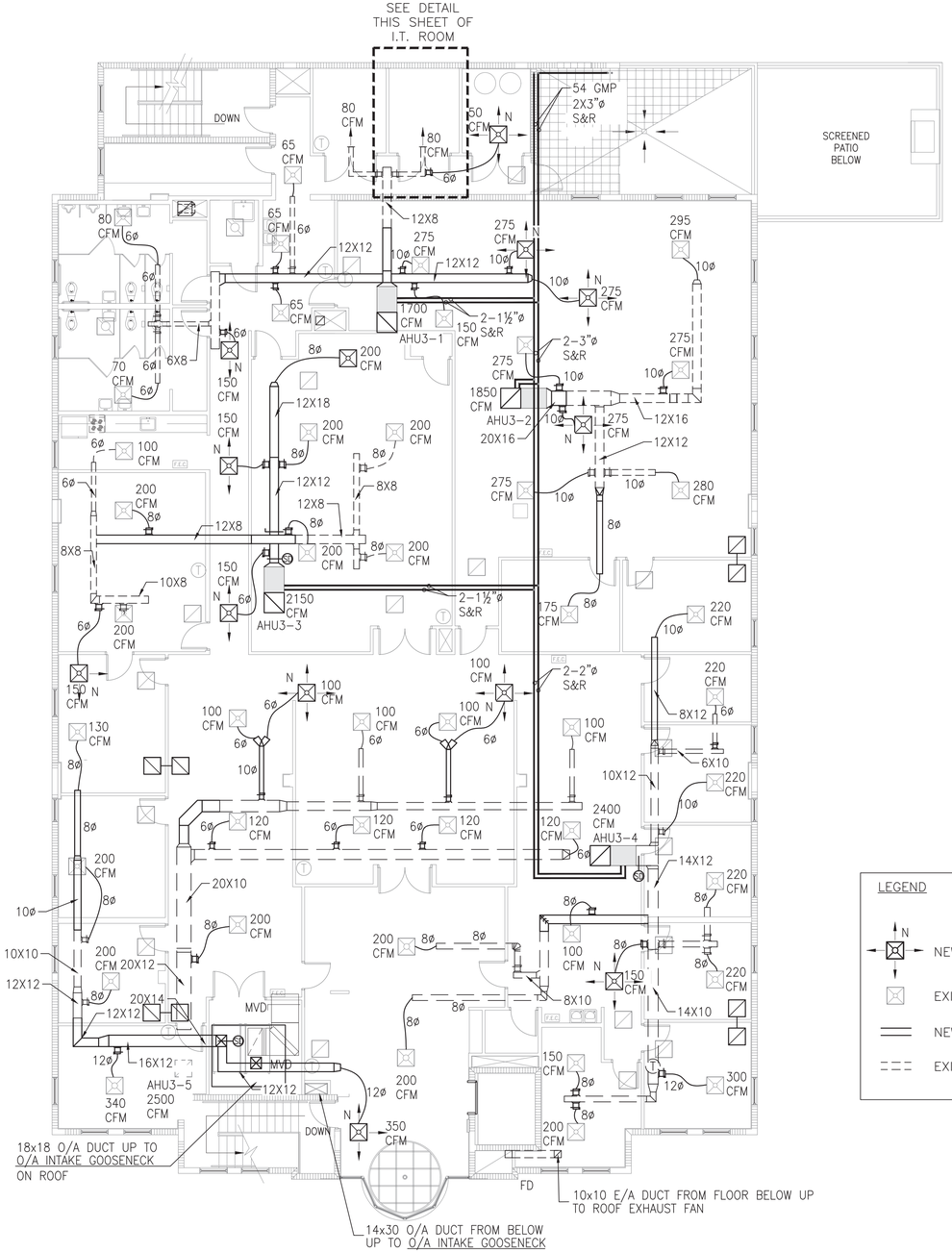


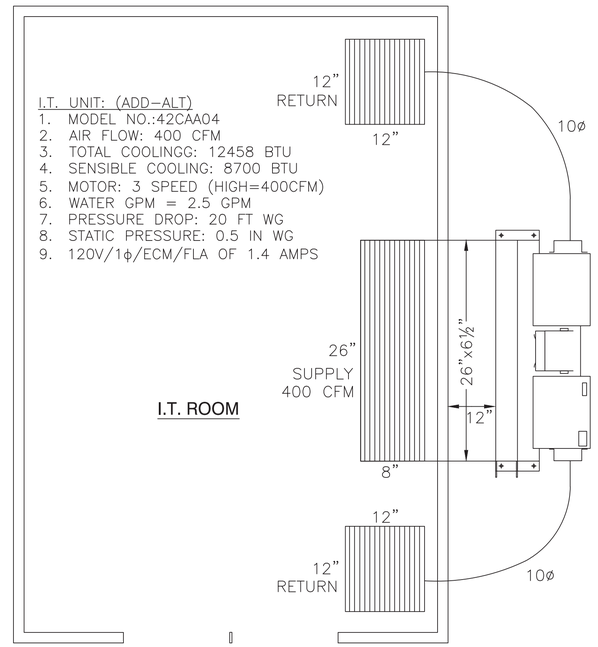
SUPPLY AIR THIRD FLOOR PLAN

SCALE:1/8"=1'-0"

ELECTRICAL ROOM

STORAGE ROOM

I.T. UNIT: (ADD-ALT)
1. MODEL NO.:42CAA04
2. AIR FLOW: 400 CFM
3. TOTAL COOLINGG: 12458 BTU
4. SENSIBLE COOLING: 8700 BTU
5. MOTOR: 3 SPEED (HIGH=400CFM)
6. WATER GPM = 2.5 GPM
7. PRESSURE DROP: 20 FT WG
8. STATIC PRESSURE: 0.5 IN WG
9. 120V/1ϕ/ECM/FLA OF 1.4 AMPS



COMMUNICATION ROOM (ADD ALTERNATE BID)

SCALE: N.T.S.

LEGEND

- NEW GRILL
- EXISTING GRILL
- NEW DUCT
- EXISTING TO REMAIN

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5059
FAX: (954) 828-5074

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DESIGNED BY: AR
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DATE: Nov. 2, 16
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PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
3RD FLOOR HVAC
NEW SUPPLY DUCTS WITH AHU'S
528 NW 2ND STREET

BID SET

SHEET NO. M09 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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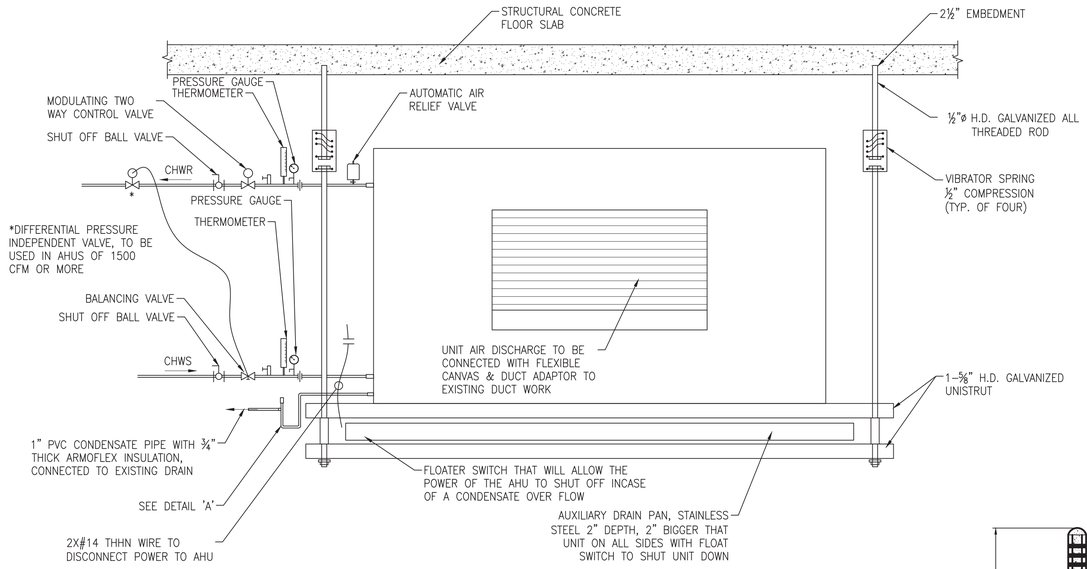
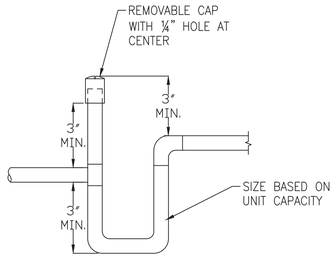


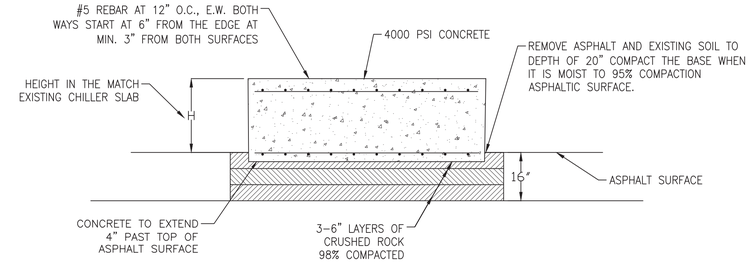
HORIZONTAL AHU HANGING ASSEMBLY (IN DROP CEILING)

SCALE: N.T.S.



DETAIL 'A'

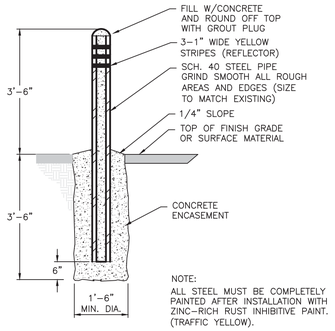
SCALE: N.T.S.



NOTES:
1. CONCRETE SLAB DIMENSION IS CHILLER DIMENSION PLUS 16" (LENGTH & WIDTH).
2. RESTORE THE DISTURBED ASPHALT AROUND FOUNDATION TO ORIGINAL.
3. THE BOTTOM OF CONCRETE SLAB SHOULD BE AT LEAST 4" BELLOW ASPHALT SURFACE.
4. TWO LAYERS OF ½" NEOPRENE 60 TO BE USED UNDER TRANSFERRING POINTS OF CHILLER WEIGHT TO SLAB.
5. CHILLER TO BE ANCHORED DOWN PER MANUFACTURER AND WIND LOAD CALCULATION, PER FLORIDA BUILDING CODE 2014.

NEW CHILLER #2 CONCRETE PAD

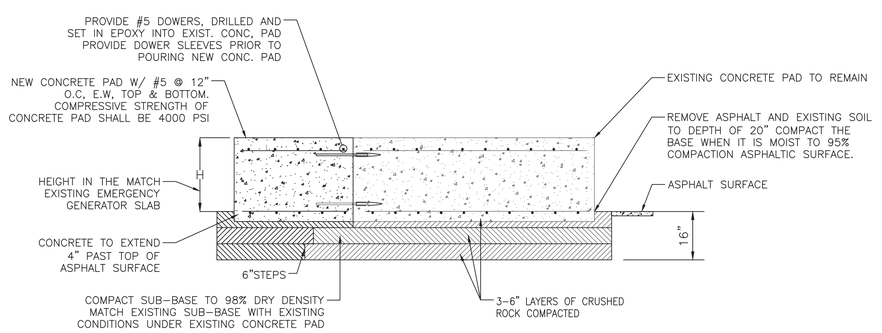
SCALE: N.T.S.



NOTE:
ALL STEEL MUST BE COMPLETELY PAINTED AFTER INSTALLATION WITH ZINC–RICH RUST INHIBITIVE PAINT. (TRAFFIC YELLOW).

BOLLARD DETAIL

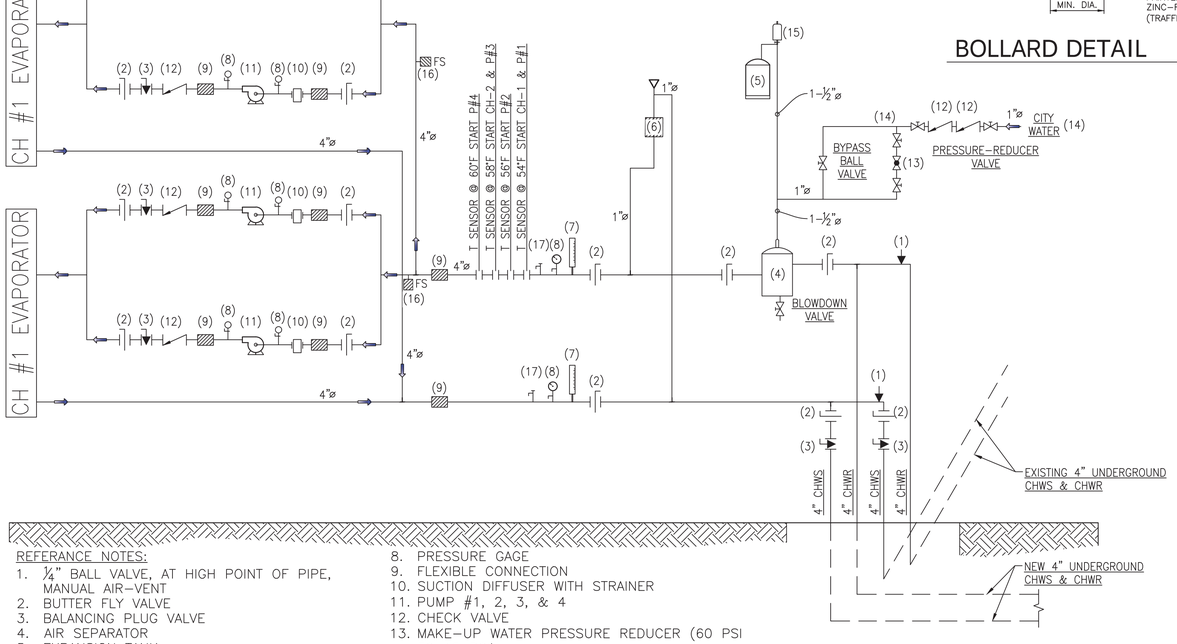
SCALE: 1/2" - 1'- 0"



NOTES
1. EXTENSION OF SLAB SHOULD BE MONOLITHIC AS MUCH AS POSSIBLE.
2. CONTRACTOR TO ROUGH IN THE EXISTING SURFACE JOINT WITH A SHARP CHISEL UNIFORMLY.
3. DRILL MIN. OF 6" EMBEDMENT, 6" FROM EDGE AND SPACING 10" C. TO C. AT MIN. 3" FROM EXISTING SLAB SURFACE TOP & BOTTOM FOR #5 DOWELS.
4. WASH THE SURFACE CLEAN FROM DUST.
5. DOWELS SHALL BE #5 REBAR MIN. 12" TO 14" IN LENGTH.
6. DOWELS SHALL BE EPOXY GLUED INTO EXISTING SLAB TIGHTLY.
7. APPLY CONCRETE BOND ON EXISTING SURFACE JOINT.
8. ALL REBARS SHALL BE GRADE 60.

CHILLER #1 MODIFIED CONCRETE PAD EXTENSION

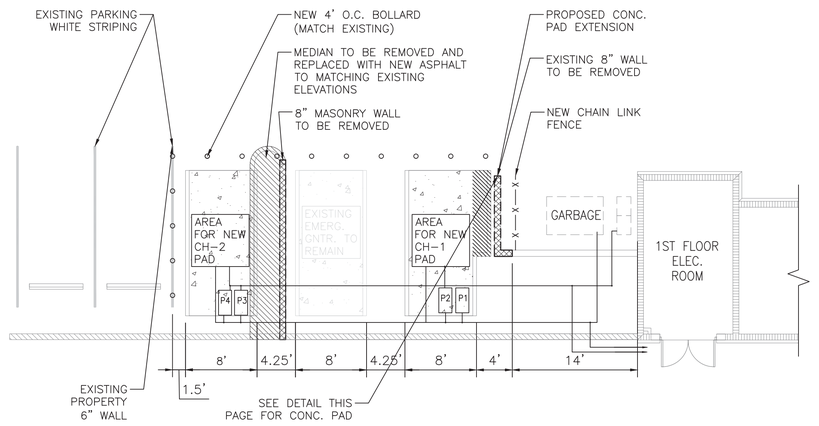
SCALE: N.T.S.



REFERANCE NOTES:
1. ¼" BALL VALVE, AT HIGH POINT OF PIPE, MANUAL AIR–VENT
2. BUTTER FLY VALVE
3. BALANCING PLUG VALVE
4. AIR SEPARATOR
5. EXPANSION TANK
6. CHEMICAL TREATMENT SHOT POT
7. THERMOMETER, 9" SCALE, WITH MOVING JOINT (ADJUSTABLE TO ANY ANGLE), 0°–100° WITH ¾" INCH. INSTALLING WELL
8. PRESSURE GAGE
9. FLEXIBLE CONNECTION
10. SUCTION DIFFUSER WITH STRAINER
11. PUMP #1, 2, 3, & 4
12. CHECK VALVE
13. MAKE–UP WATER PRESSURE REDUCER (60 PSI TO 15 PSI)
14. CITY MAKE UP WATER CONNECTION
15. AUTOMATIC AIR RELIEF VALVE
16. FLOW SWITCH

CH #1 & CH #2 PIPING CONNECTION:

SCALE: N.T.S.



NEW CHILLER YARD LAYOUT

SCALE: N.T.S.

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FRED N. MEHR
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NO.	DATE	BY	CHK'D	DESCRIPTION
REVISIONS				

BID SET

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
HVAC DETAILS
CHILLER & AHUS
528 NW 2ND STREET

SHEET NO.	OF
M10	13
TOTAL:	13
CAD FILE: 12200–MULTI–MECH	
DRAWING FILE NO. 4–140–05	

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Air Handling Unit Schedule

Sering Floor	First Floor		Second Floor									Third Floor					Roof	Building Summary			
Unit Designation	AHU1-1	AHU1-2	AHU2-1	AHU2-2	AHU2-3	AHU2-4	AHU2-5	AHU2-6	AHU2-7	AHU2-8	AHU2-9	AHU3-1	AHU3-2	AHU3-3	AHU3-4	AHU3-5	AHU-O.A.	1st Floor	2nd Floor	3rd Floor	Roof
Area Served	East Side	West Side	East	S.E	E. Center	N.E	S.W.	S. Center	S. Center	S.W.	N.W	East	S.E	North	S.W.	South	West				
Location	Mechanical Room	Mechanical Room	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Mechanical Room	Drop Ceiling	Drop Ceiling	Drop Ceiling	Drop Ceiling	Mechanical Room	Roof				
Unit Type	Vertical	Vertical	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Vertical	Horizontal	Horizontal	Horizontal	Horizontal	Vertical	Horizontal				
Fan Wheel Type	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward	Forward					
Unit Rated CFM	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)	Curved (FC)					
Design CFM	1,380	2,485	1,100	1,100	1,100	1,150	1,000	925	925	1,950	1,400	1,700	1,850	2,150	2,400	2,500	3,100	3,865	10,650	10,575	3,100
External Static Pressure, H2O"	1.0" WG	2.0" WG	0.5" WG	0.5" WG	0.5" WG	0.5" WG	0.5" WG	0.5" WG	0.5" WG	1.0" WG	1.0" WG	1.0" WG	1.0" WG	1.0" WG	1.0" WG	2.0" WG	2.0" WG				
Fan Speed, RPM	1,797	1,137	1,422	1,422	1,422	1,422	1,422	1,422	1,422	1,092	1,797	952	1,036	1,204	1,344	1,144	1,397				
Fan Break Horse Power, HP	1.1	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.18	1.1	0.9	1.06	1.43	1.64	1.5	2.7				
Fan Motor Horse Power, HP	2	2	0.71	0.71	0.71	0.71	0.71	0.71	0.71	2	1.5	2	2	2	2	2	3				
Power Voltage	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60	480V/277V/3Ø/60					
Moderated Amps	1800/2.1A	1800/2.1A	1800/0.8A	1800/0.8A	1800/0.8A	1800/0.8A	1800/0.8A	1800/0.8A	1800/0.8A	1800/2.1A	1800/1.65A	1800/2.1A	1800/2.1A	1800/2.1A	1800/2.1A	1800/2.1A	1800/3.9A				
Coil Type	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water	Chilled Water					
Unit Nominal CFM	1,500	2,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	2,200	1,500	2,200	2,200	2,200	2,500	2,500	3,200				
Face Velocity, FPM (Max-Min)	550	530	404	404	404	404	404	404	404	413	550	360	392	455	508	533	405				
Total Cooling Capacity, BTU/HR	54,000	99,000	43,400	43,400	43,400	45,300	39,400	36,500	36,500	76,900	55,200	65,600	71,400	83,000	92,600	96,400	170,190	153000=12.75	420000/35tor	409000/34	170190
Sensible Cooling Capacity, MBH	43,740	98,300	34,000	41,100	41,100	44,380	38,480	34,890	34,890	74,830	53,130	64,680	69,100	80,240	90,760	94,790	66,960	142,040	403,700	399,570	66,960
Designed Required Tonnage	4.5	8.25	3.62	3.62	3.78	3.28	3.04	3.04	6.41	4.6	5.47	5.95		6.92	7.72	8.03	14.18	12.75	35	34.08	14.18
Leaving Air Temperature, DB/WB °F	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	60.5°F/59.8	64.5°F/64°F				
Entering Air Temperature, DB/WB °F	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	80°F/69.6	95°F/78°F				
Design GPM as for Balancing Valve	10.8	19.8	8.69	8.69	8.69	9.07	7.87	7.3	7.3	15.38	11.04	13.13	14.28	16.61	18.53	19.27	34.03	30.6	84	81.8	34.03
Design GPM for Pipe Sizing (GPM)	15	24	12	12	12	12	10	9	9	20	15	16	18	20	24	24	43	37	110	102	43
Unit Water Pressure Drop (FT)	2.7	4.6	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.9	2.7	6.9	6.9	6.9	6.9	4.6	2.9				
Chilled Water Supply & Return Temp. °F	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54	44°F/54				
Chilled Water Control Valve	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo	P.L.Belimo				
Drive System	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive	Belt Drive				
Pulley	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable	Adjustable				
Unit Orientation	Vertical	Vertical	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Vertical	Horizontal	Horizontal	Horizontal	Horizontal	Vertical	Horizontal				
Installation System	Floor Mount	Floor Mount	Suspended	Suspended	Suspended	Suspended	Suspended	Suspended	Suspended	Suspended	Floor Mount	Suspended	Suspended	Suspended	Suspended	Floor Mount	Floor Mount				
Vibration Attenuation	8x1/2"NEORIN 50	8x1/2"NEOPRIN50	Spring Hanger	Spring Hanger	Spring Hanger	Spring Hanger	Spring Hanger	Spring Hanger	Spring Hanger	Spring Hanger	8x1/2"NEORIN 50	Spring Hanger	Spring Hanger			8x1/2"NEOPRIN50	8x1/2"NEOPRIN50				
Motor Starter Type	Across Line	Across Line	Across Line	Across Line	Across Line	Across Line	Across Line		Across Line	Across Line	Across Line	Across Line	Across Line	Across Line	Across Line	Across Line	VFD				
Filter	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away	2" Throw Away				
Unit Chilled Water Piping	Exist 2x1½"	2x2"	2x1¼"	2x1¼"	2x1¼"	2x1¼"	2x1.1/4"	2x1.1/4"	2x1.1/4"	2x1.1/2"	2x1.1/2"	2x1.1/2"	2x1.1/2"	2x1.1/2"	2x2"	2x2"	2x1.1/2"				
Unit Dimensions & Weight (LXWXH)	2'-5"X3'-2"X3'-10"/ 403 LB Wet	2'-9"X3'-10"X4'-5"/ 547 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-1"X3'-2"X2'-0"/ 285 LB Wet	3'-5"X3'-10"X2'-4"/ 421 LB Wet	2'-5"X3'-2"X3'-10"/ 403 LB Wet	3'-5"X3'-10"X2'-4"/ 421 LB Wet	3'-5"X3'-10"X2'-4"/ 421 LB Wet	3'-5"X3'-10"X2'-4"/ 421 LB Wet	2'-9"X3'-10"X4'-5"/ 547 LB Wet	2'-5"X4'-2"X2'-8"/ LB Wet				
Design Manufacturer	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier	Carrier				
Unit Model No.	03-39 LB	06-39 LB	03-39 LB	03-39 LB	03-39 LB	03-39 LB	03-39 LB	03-39 LB	03-39 LB	03-39 LA	03-39 LB	03-39 LA	03-39 LA	06-39 LB	06-39 LB	06-39 LB	08-39 LA				

NOTES: ALL AHUS EXCEPT O-A-UNIT, MUST HAVE BUILT-IN HEATER OF 4.5 KW/ 480V/ 277V/ 3Ø

A/C COOLING LOAD CALCULATIONS:

A. CONDITIONED AREA:
1. FIRST FLOOR WEST SECTION: 2,700 FT²
2. FIRST FLOOR EAST SECTION: 1,450 FT²
3. SECOND FLOOR CONDITIONED AREA: 12,490 FT²
4. THIRD FLOOR CONDITIONED AREA: 12,260 FT²

TOTAL: 28,900 FT²

B. FLOOR ELEVATIONS:
1. GROUND FLOOR ±0.0 FT.
2. CEILING SLAB OF FIRST FLOOR: +17 FT.
3. CEILING SLAB OF SECOND FLOOR: (17+12)=+29 FT.
4. CEILING SLAB OF THIRD FLOOR: +41 FT.
5. PARAPET: 44'-4"

C. DESIGN CONDITION:
1. TEMPERATURE: 70°F
2. RELATIVE HUMIDITY: 55%
3. OUTSIDE AIR CONDITION:
a. DRY BALL TEMPERATURE = 95°F
b. WET BALL TEMPERATURE = 78°F

D. HEAT RESISTANCE OF BUILDING COMPONENT:

ITEM	DESCRIPTION	RESISTANCE		
		WALL	2ND FL SLAB	ROOF
1	OUTSIDE AIR "SUMMER"	0.25	0.17	0.25
2	5/8" STUCCO	0.125	–	–
3	CINDER BLOCK	1.11	–	–
4	5/8" DRYWALL	0.397	–	–
5	INSIDE AIR	0.68	0.68	0.68
6	1/8" UNOLEUM	–	0.05	–
7	6" CONCRETE SLAB	–	0.4	–
8	INSULATION	–	1.5	2.31
9	BUILD-UP ROOF 1/4"	–	–	0.22
10	AIR SPACE (1/0.87)	–	–	1.15
11	TOTAL HEAT RESISTANCE = FT²°F/BTUH	2.562	2.8	4.61
12	HEAT CONDUCTIVITY = BTUH/FT²X°FT	0.39	0.357	0.217

E. TEMPERATURE DIFFERENCE ΔT FOR COMPONENTS:

a. WALLS:

WALL SOLAR HEAT GAIN (FROM MAY 20 TO JULY 23)					
DESCRIPTION		N	E	S	W
DIRECT SOLAR BTU/FT²	ΔT	11.6	176.5	148.9	176.5
	HOURS	7AM-2PM	7AM-9AM	12AM-2PM	2PM-4PM
CONDUCTION SOLAR BTU/FT²	ΔT	23.7	23.7	24.7	26.7
	HOURS	3PM	3PM	3PM	3PM

b. ROOF:

ROOF SOLAR HEAT GAIN (JUNE 21)

6" CONCRETE SLAB+2" INSULATION							
TOTAL EQUIVALENT TEMPERATURE DIFFERENTIAL	ΔT	8.8	8.8	24.1	39.2	47.6	49.6
	HOURS	8AM	10AM	12PM	2PM	4PM	6PM

F. AREA OF HEAT TRANSFER FT² (AREA OF WALLS IS GROSS AREA)

ITEM	AREAS	N WALL FT²	S WALL FT²	E WALL FT²	W WALL FT²	N WINDOW FT²	S WINDOW FT²	E WINDOW FT²	W WINDOW FT²
1	1ST FL.W.	450	450	1650	1650	48	8	0	336
	1ST FL.E.	330	330	1650	1650	48	0	48	48
2	2ND FL.	1620	1620	984	984	192	120	62	246
3	3RD FL.	1620	1620	984	984	192	120	38	246

F. HEAT GAIN THROUGH WALLS, WINDOWS, AND ROOF:

HEAT GAIN THROUGH BUILDING ELEMENTS CAN BE CALCULATED BY THE FOLLOWING EQUATION:

$$Q_{BTU/H} = A_{FT^2} \times \Delta T{\cdot}F \times U_{BTU/H \times FT^2 \times F}$$

ITEM	AREAS	N WALL BTU/H	S WALL BTU/H	E WALL BTU/H	W WALL BTU/H	N WINDOW BTU/H	S WINDOW BTU/H	E WINDOW BTU/H	W WINDOW BTU/H	TOTAL BTU/H	ROOF /CEILING BTU/H
1	1ST FL.W.	1297	1426	5321	4238	1270	1186	0	59304	74044	–
	1ST FL.E.	909	1065	3812	3967	1272	0	8472	8472	27969	–
2	2ND FL.	4605	4780	2974	2380	5088	17842	10943	43419	203522	111491
3	3RD FL.	4605	4838	3051	2380	5088	17784	6707	43419	214508	126636

G. HEAT GAIN BY LIGHTING:

HEAT GAIN CAN BE CALCULATED BY:

$Q_{BTU/H}$ = AREA FT^2 X $3W/FT^2$ X 3.4 W/BTU

1. FIRST FLOOR EAST: Q = 1450 FT^2X10.2 = 14,790 BTU/H
2. FIRST FLOOR WEST: Q = 2700 FT^2X10.2 = 27,540 BTU/H
3. SECOND FLOOR: Q = 12490 FT^2X10.2 = 127,398 BTU/H
4. THIRD FLOOR: Q = 12260 FT^2X10.2 = 125,052 BTU/H

I. OTHER HEAT GAIN:
1. HEAT GAIN FROM OCCUPANT:
Q = NoccupX(S.H. 220 BTU/H X L.H. 230 BTU/H)
2. HEAT GAIN FROM ELECTRICAL EQUIPMENT:
Q =KW X 3400 BTU/H

HEAT GAIN FOR EACH FLOOR IS GIVEN IN FOLLOWING TABLE:

* HEAT GAIN FROM OCCUPANT AND ELECTRICAL EQUIPMENT

ITEM	FLOOR	OCCUPANT NO.	OCCUPANT BTU/OCC.	OCCUPANT BTU/H	COMPUTER NO.	COMPUTER BTU/OCC.	COMPUTER BTU/H	OTHER ELECTRICAL KW	OTHER ELECTRICAL BTU/KW	OTHER ELECTRICAL BTU/H	TOTAL BTU/H
1	1W	0	450	0	0	1700	0	–	–	–	0
2	1E	5	550	2700	0	1700	0	–	–	–	2700
3	2ND	40	450	18000	15	1700	25500	8KW	3400	27200	70700
4	3RD	40	450	18000	15	1700	25500	8KW	3400	27200	70700

J. BUILDING TOTAL HEAT GAIN:

ITEM	FLOOR	BUILDING HEAT GAIN BTU/H	LIGHTING HEAT GAIN BTU/H	OCCUPANT HEAT GAIN BTU/H	COMPUTER & OTHER HEAT GAIN BTU/H	TOTAL HEAT GAIN BTU/H	TOTAL HEAT GAIN TON
1	1W	74044	27540	0	0	101584	8.46
2	1E	27969	14790	2700	0	45459	3.79
3	2ND	203522	127398	18000	52700	401620	33.47
4	3RD	214508	125052	18000	52700	410260	34.19
TOTAL HEAT GAIN						958923	79.91

Air Cooled Chillers Schedule		
Units Designation		CH-1 & CH-2
Location		Ground Area, South
Chiller Type		Air Cooled
Cooling Capacity		58.6 TON
Compressor	Compressor Type	Scroll
	Number of Compressors	2
	Motor/Compressor Speed RPM	–
	Motor Power Input (KW, MAX)	57.9 KW
	Motor Rated Load / Inrush Current	82A/570A
	Power Voltage	480V/277V/3Ø/60
Chiller	Refrigerant	R410A
	Rated Tons of Refrigeration	60
	Water Flow, GPM	145
	Leaving/Entering Water Temp °F	44/55
	No of Water Pass	
	Max Pressure Drop, ft. of H20	14.5
	Fouling Factor (HR. ft²F²/BTU)	0.0001
Condenser	Number of the Fan	4
	Total Condenser Fan Air Flow CFM	49600 CFM
	Entering Air Temperature F°	91°F
	Fan Motor HP Each/Speed RPM	3.5 / –
	Power Voltage Available	480v/277v/3ø/60Hz
Accessories	Max Condensing Temp °F	
	Chiller Pressure Drop for Pump Sizing ft. of H2O	8.6' FT/WG
	Efficiency (Without Pump)	10.30 EER
	IPLV	12.70 EER
	MCA/MOCP (AMPS)	135.0/150.0
	Unit Total Power (With Pump)KW	70.3
	Unit Total Power (Without Pump)KW	68.2
	Control System	Microprocessor
	Vibration Insulator/See Detail	2x1/2"NEOPRIN60
	Design Manufacturer	Carrier
	Unit Model Number	30RB3X060
Operating Weight, lbs.		4616
Dimensions (LxWxH) Inches		95"X89"X90"

Pump Schedule		
Unit Designation		CHWP-1 to P4
Location		Under Chiller
Total Number of Pumps		4
Serving System		Chilled Water
Pump	Type	Centrifugal
	Suction Location	End Suction
	Mount	Fram Mount
	Design Flow Rate, GPM	80
	DES.Dynamic Total Head, Ft. of H2O	75'
	SPEE RPM (Max)	1740
	Efficiency (Design Min)%	64%
	N.P.S.H (Not Less Than) Ft. of H2O	5'
	Zero Flow Head, Ft. of H2O	
Motor	Power Voltage Available	480v/277v/3ø/60
	Rated Horsepower / Break HP, HP	3HP/
	Rated Amps / Service Factor	5HP
	Power Factor	5.3/1.15
	Motor Type	TEFC
Others	Pump Operating Weight, lbs.	
	Vibration Isolator Type / Deflection	Spring / 1/2"
	Design Manufacturer	
	Design Model No.	

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828-5029
FAX: (954) 828-5074

DRAWN BY: BH
DATE: Nov. 2, 16
DESIGNED BY: AR
SCALE: AS SHOWN
CHECKED BY: IR
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
HVAC SCHEDULES
CHILLER & AHU'S
528 NW 2ND STREET

BID SET

SHEET NO. M11 OF 13
TOTAL: 13

CAD FILE: 12200-MULTI-MECH
DRAWING FILE NO. 4-140-05

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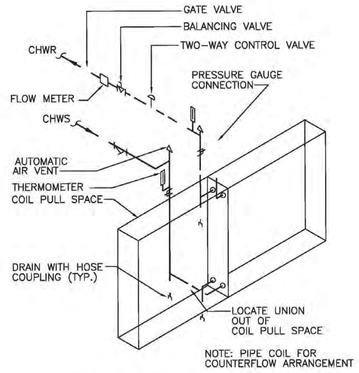
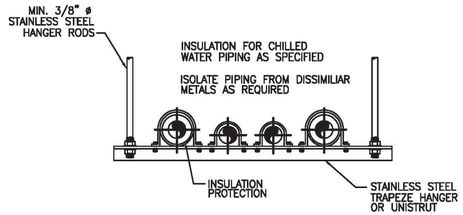


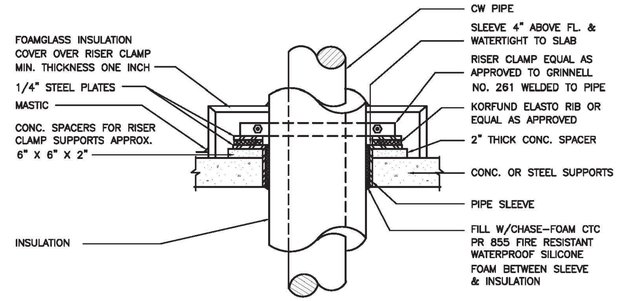
CHILLED WATER COIL PIPING DETAIL

N.T.S.



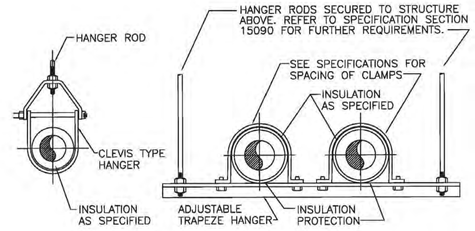
TYPICAL PIPE HANGER DETAIL

N.T.S.: TYPICAL FOR ALL REFRIGERANT PIPING INSIDE BUILDING



TYPICAL VERTICAL PIPE SUPPORT DETAIL

N.T.S.



TYPICAL PIPE HANGER DETAIL

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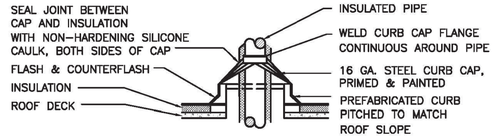
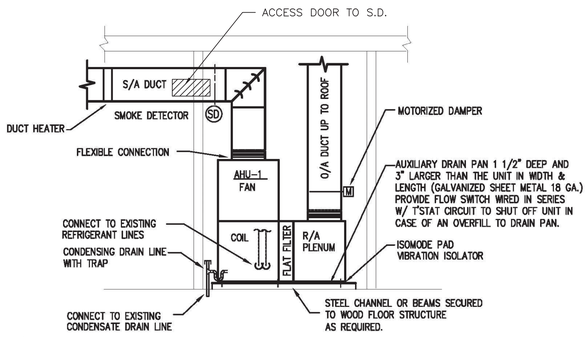


TYPICAL PIPE CURB AT ROOF PENETRATION DETAIL

N.T.S.



NOTE:

1. ALL AHU'S WITH CFM OF 2000 CFM & LARGER MUST HAVE SMOKE DETECTOR IN SUPPLY DUCT.
2. IN CASE OF SMOKE IN SUPPLY, SMOKE DETECTOR MUST SHUT DOWN THE POWER TO UNIT.
3. S.D. MUST BE CONNECTED TO FIRE ALARM SYSTEM ELECTRICITY, INCASE OF FIRE IN OTHER AREAS, S.D. SHOULD SHUT OFF THE A/C UNIT.

AIR HANDLING UNIT MOUNTING DETAIL & SMOKE DETECTOR

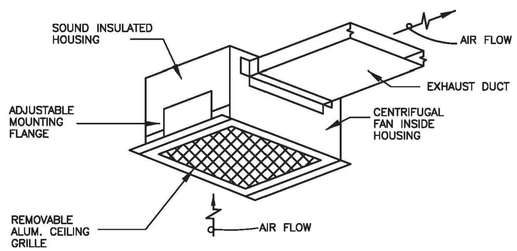
N.T.S.

SUPPORTS

THREADED RODS FOR SUPPORTING PIPE SHALL ALLOW 2 INCHES OF VERTICAL ADJUSTMENT AND SHALL HAVE TWO NUTS ON EACH END TO ALLOW POSITIONING AND LOCKING. SINGLE ROD HANGERS SHALL BE AS FOLLOWS:

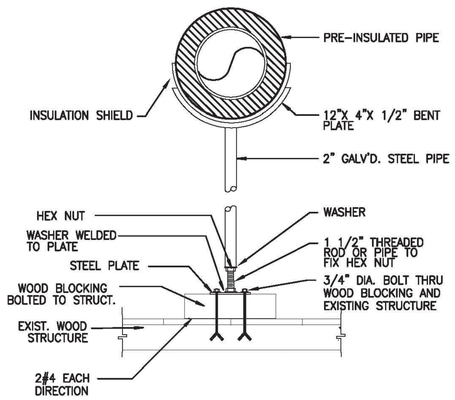
PIPE SIZES	ROD SIZE (MIN.)	MAXIMUM SPACING
1 IN.	3/8 IN.	7 FEET
1-1/2 IN.	3/8 IN.	9 FEET
2 IN.	3/8 IN.	10 FEET
2-1/2 IN.	1/2 IN.	11 FEET
3 IN.	1/2 IN.	12 FEET
3-1/2 IN.	1/2 IN	13 FEET
4 IN.	5/8 IN.	14 FEET

MAXIMUM LOADING ON INSERTS SHALL NOT EXCEED 75 PERCENT OF CATALOG RATING.



TYPICAL CEILING TYPE EXHAUST FAN DETAIL

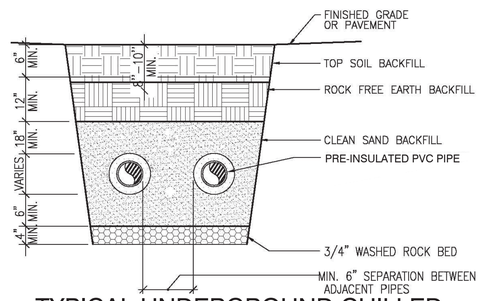
N.T.S.



ROOF PIPE SUPPORT DETAIL

N.T.S.

ALL PIPE SUPPORTS AND HARDWARE SHALL BE GALVANIZED STEEL



TYPICAL UNDERGROUND CHILLED WATER PIPING DETAIL

N.T.S.

NOTE

REFER TO MANUFACTURER INSTALLATION MANUAL FOR RECOMMENDED INSTALLATION OF UNDERGROUND CHILLED WATER PIPING.

THRUST BLOCK NOTES

1.-FOR THE UNDERGROUND CHILLED WATER PIPING, THRUST BLOCKS SHALL BE PROVIDED TO PREVENT JOINT SEPARATION UNDER PRESSURE. THRUST BLOCKS SHALL BE LOCTAED AT ALL CHANGES IN DIRECTION, CHANGES IN PIPE SIZE, TERMINAL ENDS.

2.-THRUST BLOCKS SHALL BE POURED BEFORE HYDROSTATIC TESTING. THE SYSTEM SHALL BE RETESTED AFTER THE THRUST BLOCKS ARE POURED AND CURED TO VERIFY THE THRUST BLOCKS CAN RESIST THE THRUST FORCES IMPOSED BY THE PIPE.

3.-THRUST BLOCK BEARING AREA REQUIRED (PER FITTING) FOR THE THE PIPING:
90° ELBOW (10 SQ.FT) X2=20 SQ FT
45° (5 SQ.FT) X2=10 SQ FT.
22.1/2° (3 SQ FT) X2=6 SQ FT.
TEE (7.5 SQ FT) X2=15 SQ FT.

4.-THE BEARING SURFACE MUST REST DIRECTLY AGAINST UNDISTURBED SOIL. THE FACE OF THE BLOCK BEARING SURFACE IN THE SOIL MUST BE PERPENDICULAR TO THE RESULTANT DURECTION OF THE THRUST.

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:
TEL: (954) 828-5059
FAX: (954) 828-5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Dec. 13, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CH'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
HVAC DETAILS
DETAILS SHEET
528 NW 2ND STREET

BID SET

SHEET NO. M12 OF 13

TOTAL: 13

CAD FILE: 12200-MULTI-MECH

DRAWING FILE NO. 4-140-05

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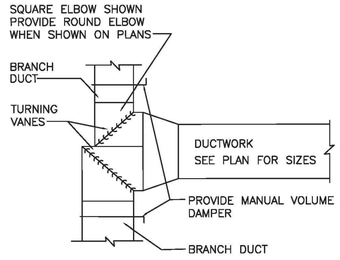
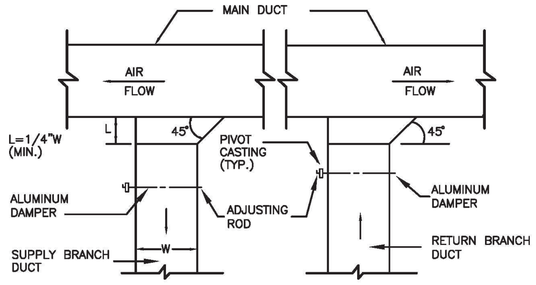


PLAN VIEW

NOTES: 1 – TYPICAL LOCATION OF MANUAL VOLUME DAMPER FOR ALL LOCATION (U.O.N.).
2 – NO MANUAL VOLUME DAMPERS REQUIRED FOR DUCTWORK IN THE AUDITORIUM AND STAGE AREAS.

SHORT SPLIT ELBOW WITH TURNING VAIN & DAMPERS

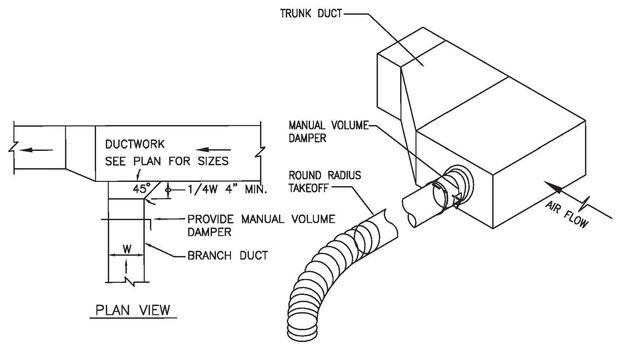
N.T.S.



DUCT BRANCH TAKE OFF DETAIL FOR LOW PRESSURE DUCT WORK

N.T.S.

NOTES:
1. FOR EXTERNALLY INSULATED DUCTS; PROVIDE 2" HIGH QUADRANT STANDOFFS FOR VOLUME DAMPERS.
2. PROVIDE FACTORY MANUFACTURED VOLUME DAMPERS SHOP FABRICATED VOLUME DAMPERS SHALL NOT BE ALLOWED.

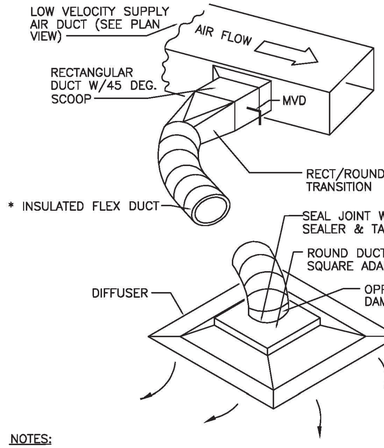


PLAN VIEW

NOTES: 1 – TYPICAL LOCATION OF MANUAL VOLUME DAMPER FOR ALL LOCATION (U.O.N.).

TYPICAL BRANCH TAKE OFF

N.T.S.



NOTES:
1 – TYPICAL LOCATION OF MANUAL VOLUME DAMPER FOR ALL LOCATION (U.O.N.).

BRANCH TAKE-OFF PROPER SCOOP

N.T.S.

FIRE DAMPER:

MANUFACTURER: RUSKIN OR APPROVED EQUAL
MODEL: DIBD2 - /UL 555, 1.5HR DYNAMIC CURTAIN
TYPE: FACTORY SLEEVE, 4000 CFM, 4" W.G
FUSIBLE LINK: 50°F + DUCT TEMPERATURE OR 170°F

(A) RETAINING ANGLES: MINIMUM 1 1/2" X 1 1/2" X 0.054 (16 GA)
(B) CLEARANCE ⅛" PER LINEAR FOOT BOTH DIMENSIONS
(C) STEEL SLEEVE: SLEEVE THICKNESS NOT TO BE LESS THAN DUCT GAGE

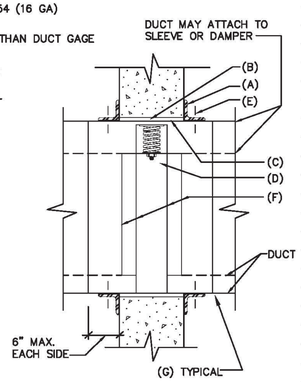
DUCT DIMENSION (IN DIAMETER OR RECTANGULAR DIMENSION)	SLEEVE GAGE	MINIMUM SLEEVE THICKNESS UNCOATED STEEL
12" DOWN	26	.018"
13" – 30"	24	.024"
31" – 54"	22	.030"
55" – 84"	20	.036"
85" – UP	18	.047"

(D) FIRE DAMPER (RUSKIN MODEL DIBD2)
(E) SECURE RETAINING ANGLES TO SLEEVE ONLY ON 8" CENTERS WITH;
1. ½" LONG WELDS. OR
2. ¼" BOLTS AND NUTS. OR
3. NO. 10 STEEL SCREWS. OR
4. MINIMUM 3/16" STEEL RIBETS

(F) SECURE DAMPER TO SLEEVE ON 8" CENTER WITH:
1. ½" LONG WELDS. OR
2. ¼" BULTS AND NUTS IN HOLES PROVIDED. OR
3. NO. 10 STEEL SCREWS. OR
4. MINIMUM 3/16" STEEL RIBETS

(G) SECURE DUCT TO SLEEVE WITH A CONNECTION AS SHOWN

(H) CONTRACTOR TO PROVIDE MANUFACTURER'S INSTALLATION INSTRUCTION OF DUCT WORK FOR SUBCONTRACTOR & FRAME CONTRACTOR.



PLAIN "S" SLIP

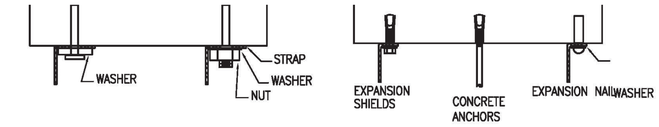
STANDING S

JOINTS SHALL BE CONSISTENT WITH DESIGNATIONS FOR DUCT PRESSURE CLASSIFICATION.

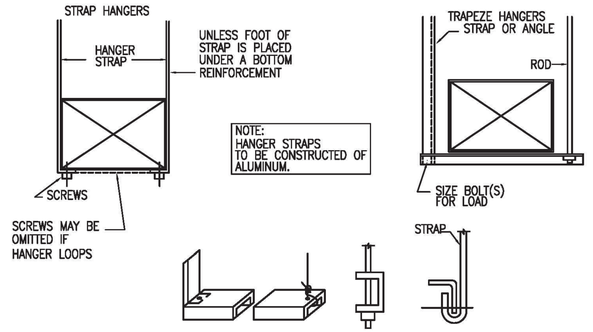
NOTES:
VERTICAL POSITION IS SHOWN; HORIZONTAL INSTALLATION IS SIMILAR OBSERVE AIR FLOW DIRECTION SPECIFIED PROVIDE ACCESS DOORS AS SPECIFIED FOLLOW INSTALLATION INSTRUCTION FOR FUSIBLE LINKS RETAINING ANGLES MUST LAP STRUCTURAL OPENING 1" MINIMUM AND COVER CORNERS OF OPENINGS. ANGLES MUST NOT BE ATTACHED TO EACH OTHER AT CORNERS.

FIRE DAMPER INSTALLATION DETAILS

N.T.S.



UPPER ATTACHMENT



HANGERS MUST NOT DEFORM DUCT SHAPE

LOWER ATTACHMENT

DUCT HANGER DETAILS

N.T.S.

WIND LOAD CALCULATION & ANCHORING:

FIRE STATION CHILLERS:

PER: ASCE-7-10
DIMENSIONS: 93"X89"X79"
WEIGHT: 2606 LB

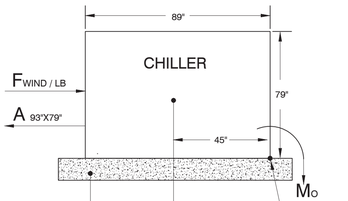
Q_z = WIND VELOCITY PRESSURE IN LB/FT²
$Q_z = 0.00256\ K_z\ (I.V.)^2$

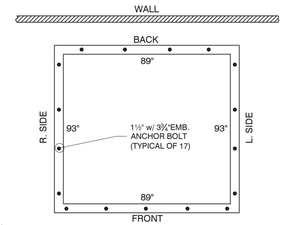
WHERE:
K_z = 0.80 FOR EXPOSURE "C" & ELEVATION H=12'
I = IMPORTANCE FACTOR = 1.05
V = VELOCITY OF 180 MPH
$Q_z = 0.00256 \times 0.8 \times (1.05 \times 180)^2 = 73.16$ LB/FT²

WIND PRESSURE ON CHILLER:

$P_{WIND} = Q_z\ [(GC_P) - (GC_{Pi})]$

WHERE:
GC_P = 1.4
GC_{Pi} = +0.25
−0.25
$P_{MAX} = Q_z[(1.4)-(-0.25)] = 1.65Q_z$
$P_{MAX} = 1.65 \times 73.16 = 120.7$ LB/FT²
$F_{WIND} = AF \cdot XP_{MAX}$
$F_{WIND} = 93" \times 79" \times 120.7/144 = 6158$ LB
$\sum M_O = 0$
$6158 \times 39.5" - 2606LB \times 45" - TX89" = 0$
$89"T = 125971$ LB X IN





MINIMUM CHILLER'S ANCHORS:

ANCHOR BOLT OF ½"DIA. WITH EMBEDMENT OF 3¾"
3000 PSI CONCRETE HAS PULLING FORCE OF 1400LB
WITH SAFTEY OF 3.5, THE ALLOWABLE FORCE IS 400LB.

NO. OF ANCHORS = 1415/400 = 3.5≈ 4 BOLTS,
½" NEOPRENE #60 TO BE USED BETWEEN CHILLER AND CONCRETE SLAB.
(5)ANCHORS IN FRONT AND (4)ANCHORS ON OTHER 3 SIDES.

THIS CALCULATION IS BASED ON "CARRIER" CHILLER WITH GIVEN DIMENSIONS.
IF CHILLER CHANGES, THE CONTRACTOR SHALL PROVIDE WIND LOAD CALCULATIONS AND TIE–DOWN BY A FLORIDA REGISTERED LICENSED P.E. ENGINEER

ELECTRICAL ENGINEER
FRED N. MEHR
REG. No: 35517
DATE:

TEL: (954) 828–5059
FAX: (954) 828–5074

DRAWN BY: BH
DESIGNED BY: AR
CHECKED BY: IR
DATE: Dec. 13, 16
SCALE: AS SHOWN
FIELD BOOK:

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT
ENGINEERING & ARCHITECTURE
100 North Andrews Avenue, Fort Lauderdale, Florida 33301

REVISIONS

NO.	DATE	BY	CHK'D	DESCRIPTION

PROJECT # 12200
FIRE STATION 2 HVAC UPGRADE
HVAC DETAILS & CALCULATIONS
DETAILS & CALCULATION SHEET
528 NW 2ND STREET

BID SET

SHEET NO.	OF
M13	13

TOTAL: 13
CAD FILE: 12200–MULTI–MECH
DRAWING FILE NO. 4–140–05

Z:\12000\200–299\12200\DESIGN\DRAWINGS\CURRENT\BID\12200–MULTI–MECH.DWG

11/20/2017 9:24 AM

CITY OF FORT LAUDERDALE
PUBLIC WORKS DEPARTMENT

MINORITY BUSINESS ENTERPRISE (MBE) - WOMEN BUSINESS ENTERPRISE (WBE)

PRIME CONTRACTOR IDENTIFICATION FORM

In order to assist us in identifying the status of those companies doing business with the City of Fort Lauderdale, this form must be completed and returned with your bid package.

Name of Firm:

Address of Firm:

Telephone Number:

Name of Person Completing Form:

Title:

Signature:

Date:

City Project Number:

City Project Description:

Please check the item(s) which properly identify the status of your firm:

☐ Our firm is not a MBE or WBE.

☐ Our firm is a MBE, as at least 51 percent is owned and operated by one or more socially and economically disadvantaged individuals.

☐ American Indian ☐ Asian ☐ Black ☐ Hispanic

☐ Our firm is a WBE, as at least 51 percent is owned and operated by one or more women.

☐ American Indian ☐ Asian ☐ Black ☐ Hispanic

MBE/WBE CONTRACTOR INFORMATION

The City, in a continuing effort, is encouraging the increased participation of minority and women-owned businesses in Public Works Department related contracts. Along those lines, we are requiring that each firm provide documentation detailing their own programs for utilizing minority and women-owned businesses.

Submit this information as a part of this bid package and refer to the checklist, to ensure that all areas of concern are covered. The low responsive bidder may be contacted to schedule a meeting to discuss these objectives. It is our intention to proceed as quickly as possible with this project, so your cooperation in this matter is appreciated.

CONTRACTOR CHECKLIST

☐ List Previous City of Fort Lauderdale Contracts

☐ Number of Employees in your firm

--Percent (%) Women

--Percent (%) Minorities

--Job Classifications of Women and Minorities

☐ Use of minority and/or women subcontractors on past projects.

☐ Nature of the work subcontracted to minority and/or women-owned firms.

☐ How are subcontractors notified of available opportunities with your firm?

☐ Anticipated amount to be subcontracted on this project.

☐ Anticipated amount to be subcontracted to minority and/or women-owned businesses on this project.

QUESTIONNAIRE SHEET

PLEASE PRINT OR TYPE:

Firm Name:

President

Business Address:

Telephone:

Fax:

E-Mail Address:

What was the last project of this nature which you completed?

The following are named as three corporations and representatives of those corporations for which you have performed work similar to that required by this contract, and which the City may contact as your references (include addresses and telephone numbers):

How many years has your organization been in business?

Have you ever failed to complete work awarded to you; if so, where and why?

The name of the qualifying agent for the firm and his position is:

Certificate of Competency Number of Qualifying Agent:

Effective Date: Expiration Date:

Licensed in: Contractor's License #(s)

(County/State)

Expiration Date:

NOTE: To be considered for award of this contract, the bidder must submit a financial statement upon request.

Contractor must have proper licensing prior to submitting bid and must submit evidence of same with bid.

QUESTIONNAIRE SHEET

1. Have you personally inspected the proposed work and have you a complete plan for its performance?

2. Will you sublet any part of this work? If so, list the portions or specialties of the work that you will.

a)
b)
c)
d)
e)
f)
g)

3. What equipment do you own that is available for the work?

4. What equipment will you purchase for the proposed work?

5. What equipment will you rent for the proposed work?

LOCAL BUSINESS PREFERENCE

Section 2-199.2, Code of Ordinances of the City of Fort Lauderdale, (Ordinance No. C-12-04), provides for a local business preference.

In order to be considered for a local business preference, a bidder must include the Local Business Preference Certification Statement of this ITB, as applicable to the local business preference class claimed **at the time of bid submittal**:

Upon formal request of the City, based on the application of a Local Business Preference the Bidder shall within ten (10) calendar days submit the following documentation to the Local Business Preference Class claimed:

A) Copy of City of Fort Lauderdale current year business tax receipt, **or** Broward County current year business tax receipt, **and**

B) List of the names of all employees of the bidder and evidence of employees' residence within the geographic bounds of the City of Fort Lauderdale or Broward County, as the case may be, such as current Florida driver license, residential utility bill (water, electric, telephone, cable television), or other type of similar documentation acceptable to the City.

Failure to comply at time of bid submittal shall result in the bidder being found ineligible for the local business preference.

THE COMPLETE LOCAL BUSINESS PREFERENCE ORDINANCE MAY BE FOUND ON THE CITY'S WEB SITE AT THE FOLLOWING LINK:
http:/www.fortlauderdale.gov/purchasing/index.htm

Definitions: The term "Business" shall mean a person, firm, corporation or other business entity which is duly licensed and authorized to engage in a particular work in the State of Florida. Business shall be broken down into four (4) types of classes:

1. Class A Business – shall mean any Business that has established and agrees to maintain a permanent place of business located in a non-residential zone and staffed with full-time employees within the limits of the City **and** shall maintain a staffing level of the prime contractor for the proposed work of at least fifty percent (50%) who are residents of the City.
2. Class B Business - shall mean any Business that has established and agrees to maintain a permanent place of business located in a non-residential zone and staffed with full-time employees within the limits of the City **or** shall maintain a staffing level of the prime contractor for the proposed work of at least fifty percent (50%) who are residents of the City.
3. Class C Business - shall mean any Business that has established and agrees to maintain a permanent place of business located in a non-residential zone **and** staffed with full-time employees within the limits of Broward County.
4. Class D Business – shall mean any Business that does not qualify as either a Class A, Class B, or Class C business.

LOCAL BUSINESS PREFERENCE CERTIFICATION STATEMENT

The Business identified below certifies that it qualifies for the local BUSINESS preference classification as indicated herein, and further certifies and agrees that it will re-affirm its local preference classification annually no later than thirty (30) calendar days prior to the anniversary of the date of a contract awarded pursuant to this ITB. Violation of the foregoing provision may result in contract termination.

(1) _____ Business Name is a **Class A** Business as defined in City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. A copy of the City of Fort Lauderdale current year Business Tax Receipt **and** a complete list of full-time employees and their addresses shall be provided within 10 calendar days of a formal request by the City.

(2) _____ Business Name is a **Class B** Business as defined in the City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. A copy of the Business Tax Receipt **or** a complete list of full-time employees and their addresses shall be provided within 10 calendar days of a formal request by the City.

(3) _____ Business Name is a **Class C** Business as defined in the City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. A copy of the Broward County Business Tax Receipt shall be provided within 10 calendar days of a formal request by the City.

(4) _____ Business Name requests a **Conditional Class A** classification as defined in the City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. Written certification of intent shall be provided within 10 calendar days of a formal request by the City.

(5) _____ Business Name requests a **Conditional Class B** classification as defined in the City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. Written certification of intent shall be provided within 10 calendar days of a formal request by the City.

(6) _____ Business Name is considered a **Class D** Business as defined in the City of Fort Lauderdale Ordinance No. C-12-04, Sec.2-199.2. and does not qualify for Local Preference consideration.

BIDDER'S COMPANY: _____

AUTHORIZED COMPANY PERSON: _____

NAME SIGNATURE DATE

TRENCH SAFETY

Bidder acknowledges that included in the appropriate bid items of his bid and in the Total Bid Price are costs for complying with the Florida Trench Safety Act, Florida Statutes 553.60 – 553.64. The bidder further identifies the costs of such compliance to be summarized below:

Trench Safety Measure (Description)	Units of Measure (LF/SF)	Unit (Quantity)	Unit Cost	Extended Cost
A.			$	$
B.			$	$
C.			$	$
D.			$	$

Total: $

The bidder certifies that all trench excavation done within his control in excess of five feet (5') in depth shall be in accordance with the Occupational Safety and Health Administration's excavation safety standards, C.F.R. s. 1926.650 Subpart P., and the Florida Trench Safety Act, Florida Statutes 553.60-553.64.

Failure to complete the above may result in the bid being declared non-responsive.

DATE: (SIGNATURE)

STATE OF: COUNTY OF:

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

(Name of Individual Signing)

who, after first being duly sworn by me, affixed his/her signature in the space provided above on this day of , 20 .

NOTARY PUBLIC

My Commission Expires:

NON-COLLUSION STATEMENT:

By signing this offer, the vendor/contractor certifies that this offer is made independently and *free* from collusion. Vendor shall disclose below any City of Fort Lauderdale, FL officer or employee, or any relative of any such officer or employee who is an officer or director of, or has a material interest in, the vendor's business, who is in a position to influence this procurement.

Any City of Fort Lauderdale, FL officer or employee who has any input into the writing of specifications or requirements, solicitation of offers, decision to award, evaluation of offers, or any other activity pertinent to this procurement is presumed, for purposes hereof, to be in a position to influence this procurement.

For purposes hereof, a person has a material interest if they directly or indirectly own more than 5 percent of the total assets or capital stock of any business entity, or if they otherwise stand to personally gain if the contract is awarded to this vendor.

In accordance with City of Fort Lauderdale, FL Policy and Standards Manual, 6.10.8.3,

3.3. City employees may not contract with the City through any corporation or business entity in which they or their immediate family members hold a controlling financial interest (e.g. ownership of five (5) percent or more).

3.4. Immediate family members (spouse, parents and children) are also prohibited from contracting with the City subject to the same general rules.

Failure of a vendor to disclose any relationship described herein shall be reason for debarment in accordance with the provisions of the City Procurement Code.

NAME	RELATIONSHIPS

In the event the vendor does not indicate any names, the City shall interpret this to mean that the vendor has indicated that no such relationships exist.

CONTRACT PAYMENT METHOD

The City of Fort Lauderdale has implemented a Procurement Card (P-Card) program which changes how payments are remitted to its vendors. The City is transitioning from traditional paper checks to credit card payments via MasterCard or Visa as part of this program.

This allows you as a vendor of the City of Fort Lauderdale, to receive your payment fast and safely. No more waiting for checks to be printed and mailed.

In accordance with Article 7, item 7.6 of the contract, payments on this contract will be made utilizing the City's P-Card. Accordingly, bidders must presently have the ability to accept these credit cards or take whatever steps necessary to implement acceptance of a card before the start of the contract term, or contract award by the City.

Please indicate with which credit card you prefer to be paid:

☐ Master Card

☐ Visa Card

Company Name:	
Signature:	
Print Name Title:	

CONSTRUCTION BID CERTIFICATION

Please Note: All fields below must be completed. If the field does not apply to you, please note N/A in that field. If you are a foreign corporation, you may be required to obtain a certificate of authority from the department of state, in accordance with Florida Statute §607.1501 (visit http://www.dos.state.fl.us/).

Company: (Legal Registration)

Address:

City: State: Zip:

Telephone No. FAX No. Email:

Does your firm qualify for MBE or WBE status: MBE ☐ WBE ☐

If a corporation, state the name of the President, Secretary and Resident Agent. If a partnership, state the names of all partners. If a trade name, state the names of the individuals who do business under the trade name.

Name	Title	Name	Title
Name	Title	Name	Name

ADDENDUM ACKNOWLEDGEMENT - Bidder acknowledges that the following addenda have been received and are included in the bid:

Addendum No.	Date Received	Addendum No.	Date Received	Addendum No.	Date Received	Addendum No.	Date Received

VARIANCES: If you take exception or have variances to any term, condition, specification, or requirement in this bid you must specify such variance in the space provided below or reference in the space provided below all variances contained on other pages within your bid. Additional pages may be attached if necessary. No variances will be deemed to be part of the bid submitted unless such is listed and contained in the space provided below. The City does not, by virtue of submitting a variance, necessarily accept any variances. If no statement is contained in the below space, it is hereby implied that your response is in full compliance with this competitive solicitation. If you do not have variances, simply mark N/A. If submitting your response electronically through BIDSYNC you must also click the "Take Exception" button.

The below signatory affirms that he has or will obtain all required permits and licenses from the appropriate agencies, and that his firm is authorized to do business in the State of Florida. The below signatory agrees to furnish all labor, tools, material, equipment and supplies, and to sustain all the expense incurred in doing the work set forth in strict accordance with the bid plans and contract documents at the unit prices indicated if awarded a contract. The below signatory has not divulged to, discussed, or compared this bid with other bidders, and has not colluded with any other bidder or parties to this bid whatsoever. Furthermore, the undersigned guarantees the truth and accuracy of all statements and answers contained in this bid. The below signatory also hereby agrees, by virtue of submitting or attempting to submit a bid, that in no event shall the City's liability for bodder's direct, indirect, incidental, consequential, special or exemplary damages, expenses, or lost profits arising out of this competitive solicitation process, including but not limited to public advertisement, bid conferences, site visits, evaluations, oral presentations, or award proceedings exceed the amount of Five Hundred Dollars ($500.00). This limitation shall not apply to claims arising under any provision of indemnification or the City protest ordinance contained in this competitive solicitation.

Submitted by:

Name (printed)

Date:

Signature

Date:

City of Fort Lauderdale • Procurement Services Division
100 N. Andrews Avenue, 619 • Fort Lauderdale, Florida 33301
954-828-5933 Fax 954-828-5576
purchase@fortlauderdale.gov

ITB NO. 673-12019
FIRE STATION NO. 2 HEATING, VENTILATION & AIR CONDITIONING (HVAC) UPGRADES
(P12200 Re-Bid)

ADDENDUM NO. 1

ISSUED: August 23, 2017

This Addendum is being issued in response to Bidsync Question 3, Grill Schedule. It is hereby made a part of the Plans and Specifications and shall be included with all contract documents.

Acknowledge receipt of this Addendum by inserting its number and date on the CITB Construction Bid Certification Page.

HVAC System Grill Schedule:

Except where the drawings require new grills as indicated on reflected ceiling drawings, the existing grills should be cleaned and reused. The new grills should meet the following requirements:

1. **New grills in sleeping rooms are 2'x2' lay-in with butterfly damper. Total - 30 grills.**
2. **All A/C units installed in ceiling shall have new 2'x2' lay-in return grills.**
3. **All vertical floor mounted A/C units shall have 2'x2' wall-mounted return grills.**

All return grills must have filter rack, and the filter should be changeable from the front face of the grill.

All other terms, conditions, and specifications remain unchanged.

Maureen Lewis, MBA
Procurement Specialist II

Company Name: _____
(please print)

Bidder's Signature: _____

Date: _____

PRE-BID MEETING/SITE VISIT
ATTENDANCE SIGN-IN FORM

P12200 RE-BID

DATE: **8/31/2017** TIME: **10:00 a.m.**

BID NO.: **673-12019** OPENING DATE: **9/14/2017**

ITB/~~RFQ~~ TITLE: **Fire Station #2 HVAC Upgrades (P12200 Re-Bid)**

PROCUREMENT CONTACT: **Maureen Lewis** PROJECT MANAGER: **Alex Rio/Irina Tokar**

#	NAME	COMPANY	PHONE	EMAIL
1	Maureen Lewis	City of Ft. Lauderdale	9/828-5239	maureenl@fortlauderdale.gov
2	Alex Rio	City of Ft. Lauderdale	9/828-5389	ario@fortlauderdale.gov
3	Nader Nazha	Cedars - Electromechanical	561 – 588-4088	johng@cedarsinc.com
4	FRANK MONTI	KOLDAIRE, INC	9/747-3690	FMONTI@KOLDAIRE.NET
5	KARA BAYS	HB HOFFMAN, LLC	954-302-7325	KBAYS@HBHOFFMANLLC.COM
6	Joshua Robbins	Advanced Air	904 892-3358	joshuaR@Advancedairsystem.com

PRE-BID MEETING/SITE VISIT
ATTENDANCE SIGN-IN FORM

P12200 RE-BID

#	NAME	COMPANY	PHONE	EMAIL
7	Isan Santibanez	Premier A/C	305 888 3826	ISantibanez@ [redacted] trustPremierAC.com
8	Bob Garrison	Garrison Mechanical	954-658-3800	bob.garrison@garrisonmechanical.com
9	TIM YODER	GARRISON Mechanical	954. 441 7000	tim.yoder@garrisonmechanical.com
10	Jeff Campen	Pyke Mechanical	305 884 5600	JCampen@pykemechanical.com
11	MIKE AFFRONTE	PYKE MECHANICAL INC	305 884 5600	MAFFRONT@AOL.COM
12	GARY Bays	HB Hoffman	754 4775	KBays@hbhoffmanllc.com
13	BOB HARRIS	AIRMATIC CONTROLS, INC.	954 370-7282	BHARRIS@AIRMATICAC.COM
14	J.D. Hughes	C.F.L Engineering	(954) 520-0795	jhughes@fortlauderdale.gov
15	J. Robinson	FLFR	954 829 6620	JRobinson@fortlauderdale.gov

PRE-BID MEETING/SITE VISIT ATTENDANCE SIGN-IN FORM

P12200 RE-BID

#	NAME	COMPANY	PHONE	E-MAIL
16	Chantal Botting	FLFR	954-828-6864	Cbotting@fortlauderdale.gov.
17				
18				
19				
20				
21				
22				
23				
24				

City of Fort Lauderdale • Procurement Services Division
100 N. Andrews Avenue, 619 • Fort Lauderdale, Florida 33301
954-828-5933 Fax 954-828-5576
purchase@fortlauderdale.gov

ITB NO. 673-12019
FIRE STATION NO. 2 HEATING, VENTILATION & AIR CONDITIONING (HVAC) UPGRADES
(P12200 Re-Bid)

ADDENDUM NO. 4

ISSUED: September 14, 2017

This Addendum is being issued to provide the following information. It is hereby made a part of the Plans and Specifications and shall be included with all contract documents.

Acknowledge receipt of this Addendum by inserting its number and date on the CITB Construction Bid Certification Page.

1. **Bid Opening Date has been changed to TUESDAY, OCTOBER 3, 2017.**

2. **A second site visit is scheduled for 10:00 a.m., WEDNESDAY, SEPTEMBER 20, 2017, at the following location**

   Fire Station No. 2
   528 NW 2nd Street
   Fort Lauderdale, Florida 33311

All other terms, conditions, and specifications remain unchanged.

Maureen Lewis, MBA
Procurement Specialist II

Company Name: _____
(please print)

Bidder's Signature: _____

Date: _____

PRE-BID MEETING/SITE VISIT
ATTENDANCE SIGN-IN FORM

P12200 RE-BID

DATE: **9/20/2017** TIME: **10:00 a.m.**

BID NO.: **673-12019** OPENING DATE: **10/3/2017**

ITB/~~RFQ~~ TITLE: **Fire Station #2 HVAC Upgrades (P12200 Re-Bid)**

PROCUREMENT CONTACT: **Maureen Lewis** PROJECT MANAGER: **Alex Rio/Irina Tokar**

#	NAME	COMPANY	PHONE	EMAIL
1	Fred Mehr NOT AVAILABLE	City of Ft. Lauderdale	9/828-5059	fmehr@fortlauderdale.gov
2	Alex Rio	City of Ft. Lauderdale	9/828-5389	ario@fortlauderdale.gov
3	James JD Hughes	City of Ft. Lauderdale	9/520-0795	jhughes@fortlauderdale.gov
4	Jorge Morel Jr.	ACR-O-DYNAMICS	5616673572	JorgeMrL@Yahoo.com
5	Billy Estevez	COASTAL ComFort	7544456889	Billye@CoastalComFortAC.com
6	Johnny D Robinson	FLFR	954 829 6600	JRobinson@fortlauderdale.gov

Question and Answers for Bid #673-12019 - Fire Station No.2 Heating, Ventilation & Air Conditioning Upgrades (12200 ReBid)

Overall Bid Questions

Question 1

Is the Prime bidder required to hold both a GC & Mechanical Contractors License?
If no - please confirm what types of Mechanical Contractors licenses are acceptable.
IE is a CAC license valid to bid as prime? **(Submitted: Aug 15, 2017 8:36:53 AM EDT)**

Answer

- Possession of a State of Florida Mechanical Contractor's license OR a General Contractor's license is required for this Project.
In addition,the mechanical scope of work can be done by Class A mechanical contractor. The electrical scope needs to be done by licensed electrical contractor. **(Answered: Aug 22, 2017 1:49:46 PM EDT)**

Question 2

What is the budget for this project? **(Submitted: Aug 16, 2017 11:38:10 AM EDT)**

Answer

- Estimated construction cost is $850,000 excluding alternates and allowances. **(Answered: Aug 24, 2017 1:14:44 PM EDT)**

Question 3

Please supply the grill schedule for the HVAC system. **(Submitted: Aug 21, 2017 3:15:33 PM EDT)**

Answer

- Please see Addendum 1. **(Answered: Aug 23, 2017 12:49:58 PM EDT)**

Question 4

Please supply the manufacturer and model of all the grilles. **(Submitted: Aug 31, 2017 12:35:01 PM EDT)**

Answer

- All existing grilles shall be cleaned and re-used as per plans. In addition, thirty (30) new grilles shall be provided with butterfly dampers adjustable through 5/16Ã¢Â€Â hole in the center of grille. New grilles shall match the existing grilles. **(Answered: Sep 20, 2017 4:07:30 PM EDT)**

Question 5

In a previous response it was stated that the mechanical scope of work can be done by Class A mechanical contractor.
Also pursuant to the previous bid & Pursuant to the 2016 Florida Statues 489.105 (f) and (i) definitions of Class A and Mechanical Contractors there is no work within this project that can not or is not allowed to be completed by a Class A AC License.
Please confirm. **(Submitted: Aug 31, 2017 12:42:06 PM EDT)**

Answer

- The following licenses are acceptable for this Project:
A Florida Certified General Contractor, Florida Certified Mechanical Contractor or Florida Certified Class A Air conditioning contractor.
The contractor shall be able to complete all work as specified and shall be able to pull all the permits required as per scope. **(Answered: Sep 20, 2017 4:07:30 PM EDT)**

Question 6

Can we schedule a second visit with our subs to see additional areas of work? **(Submitted: Sep 1, 2017 3:18:25 PM EDT)**

Answer

- See Addendum 4. **(Answered: Sep 14, 2017 5:00:12 PM EDT)**

Question 7

1. Where is the drain lines connected to from the air handlers? Not shown in drawings.

2. What type of tsats are required to be compatible with your control system?

3. There is no control wiring shown to your existing system for connection

4. The chilled water lines cannot be buried behind the new chiller. There is a power line pole installed in the piping path along with electric lines for the parking lighting.

5. There is electric wiring in the parking lot where the new chiller pad is to b installed. The underground electric needs to be moved. (Not in quote).

6. The drawing shows an installation of a unit and curb to be installed on the roof. Where does the drain line connected to?

7. The new chilled water lines to the floors do not show the riser penetrations into the building.

8. What brand of smoke detectors are compatible with your system?

9. The drawings do not show fire dampers at the floor penetrations. Are the required/

10. Is there a Broward county product approval for the installation of that type of chilled water piping?

11. Chiller â€“ AHU manufacturer (What are acceptable alternates?)

12. What is the cost of the permit?

13. Who is responsible for any additional engineering? (i.e. Mechanical, Electrical, Structural, Fire, Etc.)

(Submitted: Sep 1, 2017 3:20:47 PM EDT)

Answer

- 1. Contractor shall install new 1-1/4Ã¢Â€Â schedule 40 PVC piping from the new units to the existing main line running to the existing mechanical rooms. The existing drain lines from the mechanical rooms shall carry the condensate water to the outside. Contractor shall clean all existing drain lines to achieve proper dispose of the condensate water.
2. Thermostats shall be provided as part of A/C package by A/C manufacturer. Thermostat shall be at least 7 day programmable with Wi-Fi.
3. Control wiring is included in Control system and shall be part of A/C equipment package.
4. Chilled water piping around the chillers shall be installed above the ground. New 4Ã¢Â€Âœ chilled water supply & return piping is located on another side of the wall as per M-08.
5. The existing light pole shall remain. If wiring needs to be rerouted due to the new chiller, it shall be part of the base bid.
6. The new drain line of the new roof top unit shall be connected to the existing line located in 3rd floor mechanical room.
7. The new chilled water lines to the floors are shown. Please refer to M08 and M09.
8. The new smoke detectors shall work with the existing fire panel. Contractor shall coordinate with our fire monitoring company and the proposed smoke detector shall be approved by the Engineer of record.
9. There are no ducts floor penetrations; only in fire rated chase.
10. No product approval is required for the chilled water piping.
11. The design is based on Ã¢Â€ÂœCarrierÃ¢Â€Â equipment. If you would like to submit a substitute, please follow the procedures outlined in Division 1, Section 012500 and General Conditions-03-Substitutions.

12. The direct cost of the permit fees shall be paid from the permit allowance item established in the amount of $8,000 and shall be reimbursed as per contract.
13. The Project has been pre-permitted prior to the bid (the permit number #1611958). Contractor shall be responsible to pull the master permit and all sub-permits. Contractor shall be responsible for all required shop drawings. **(Answered: Sep 13, 2017 4:23:09 PM EDT)**
- The following are additional to the responses provided for Questions 1 & 8 above:
QUESTION 1:
Contractor shall install new 1-1/4Ã¢Â€Â schedule 40 PVC piping from the new units to new 1 Ã‚Â½Ã¢Â€Â line running to the existing mechanical rooms. All condensate drain lines shall be insulated with Ã‚Â½Ã¢Â€Â rubber expanded foam (Armoflex Insulation). The existing drain lines from the mechanical rooms shall carry the condensate water to the outside. Contractor shall clean all existing drain lines to achieve proper dispose of the condensate water.
QUESTION 8:
The new smoke detectors shall work with the existing fire panel. The existing fire alarm panel is Ã¢Â€Âœ Edwards Systems Technology (EST2)Ã¢Â€Â . Contractor shall coordinate with our fire monitoring Company and the proposed smoke detector shall be approved by the Engineer of record. Fire alarm service provider is Ã¢Â€Âœ Protection OneÃ¢Â€Â , 1-877-776-1911. **(Answered: Sep 20, 2017 4:16:36 PM EDT)**

Question 8

Do you have a start date in mind for when work on the project needs to begin? **(Submitted: Sep 7, 2017 12:27:01 PM EDT)**

Answer

- We will issue a Notice to Proceed to the Contractor as soon as the contract is fully executed. It usually takes 2 months after the bid opening date. **(Answered: Sep 13, 2017 12:00:07 PM EDT)**