



INVITATION FOR BID (IFB) #09-0834DC SW REGIONAL WASTEWATER TREATMENT PLANT ADMINISTRATION BUILDING RENOVATIONS

Manatee County, a political subdivision of the State of Florida, (hereinafter "Manatee County" or the "County" or "Owner") will receive sealed bids from individuals, corporations, partnerships, and other legal entities organized under the laws of the State of Florida or authorized to conduct business in the State of Florida.

INFORMATION CONFERENCE AND SITE VISIT

In order to insure that all prospective bidders or proposers have sufficient information and understanding of the County's needs, an information conference will be held March 10, 2009 at 10:00 A.M. at the Southwest Regional Wastewater Treatment Plant (SWRWTP), 5101 65th Street West, Bradenton, Florida. All interested bidders are encouraged to attend. An inspection of the project site will immediately follow the Information Conference.

DEADLINE FOR CLARIFICATION REQUESTS: March 17, 2009 at 10:00 A.M.

TIME AND DATE DUE: March 24, 2009 at 3:00 P.M.

Manatee County Purchasing, 1112 Manatee Avenue West, Bradenton, FL 34205

TABLE OF CONTENTS

00010 Information to Bidders or Proposers	00010-1 - 8
00020 Basis of Award	00020-1 - 2
00030 Terms and Conditions	00030-1 - 7
00100 Instruction to Bidders	00100-1 - 2
00300 Bid Form	00300-1 - 2
00430 Contractor's Questionnaire	00430-1 - 3
00491 Certification Forms	00491-1 - 4
00500 Form of Agreement	00500-1 - 4
00550 Project Management Forms	00550-1 - 10
00700 General Conditions	00700-1 - 19
Technical Specifications	
Project Drawings	
No Bid Statement	

Important Note: A prohibition of Lobbying has been enacted. Please review paragraph A.23 carefully to avoid violation and possible sanctions.

FOR INFORMATION CONTACT: DEBORAH CAREY-REED
(941) 749-3074 FAX (941) 749-3034
deborah.carey-reed@mymanatee.org

AUTHORIZED FOR RELEASE: A handwritten signature of Deborah Carey-Reed in blue ink, consisting of the initials "DC" and a stylized surname.

SECTION 00010
INFORMATION TO BIDDERS OR PROPOSERS

A.01 OPENING LOCATION

These bids will be publicly opened at Manatee County Purchasing, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205 in the presence of County officials at the time and date stated, or soon thereafter. All bidders or proposers or their representatives are invited to be present.

A.02 INSPECTION OF THE SITE

Prior to the submission of a bid, each bidder or proposer shall visit the site to become familiar with all conditions that may affect services that are required to completely execute the full intent of these specifications. For **coordination of site inspection, bidders can contact the Owner's Representative, Ms. Lupe Turner at 941-792-8811 extension 5459**. Inspection of the site is a requirement to be considered for award of this contract.

A.03 BID AND PROPOSAL DOCUMENTS

Bids and Proposals on <http://www.mymanatee.org>

Bid or Proposal documents and the Notices of Source Selection related to those Bids or Proposals are available for download in a portable document format (.PDF) file on the Manatee County web page on the Purchasing tab under "Bids and Proposals." You may view and print these files using Adobe Acrobat software. You may download a free copy of this software (Adobe) from the County's web page if you do not have it. **Manatee County collaborates with the Manatee Chamber of Commerce** on distributing solicitations using the RFP Tool web page on the Chambers website: <http://www.Manateechamber.com> to post Bid and Proposal documents in a portable document format (.PDF) file. This step is in addition to the posting on Manatee County Government web pages.

Manatee County may also use an internet service provider to distribute Bids and Proposals. A link to that service <http://www.DemandStar.com>, is provided on this website under the Tab "DemandStar". Participation in the DemandStar system is not a requirement for doing business with Manatee County.

Note: The County posts the Notice of Source Selection seven calendar days prior to the effective date of the award.

IT IS THE RESPONSIBILITY OF EACH VENDOR, PRIOR TO SUBMITTING THEIR BID or PROPOSAL, TO CONTACT THE MANATEE COUNTY PURCHASING OFFICE (see contact information on page one of this document) TO DETERMINE IF ADDENDA WERE ISSUED AND TO MAKE SUCH ADDENDA A PART OF THEIR BID or PROPOSAL.

A public internet connection is available during regular business hours in the lobby of the Purchasing Division. If you have questions which cannot be answered by these sources, please contact the individual named on the front page of the bid or proposal.

A.04 BID AND PROPOSAL FORM DELIVERY REQUIREMENTS

Any bids or proposals received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder or proposer to have their bid or proposal delivered to the Manatee County Purchasing Division for receipt on or before the stated time and date. If a bid or proposal is sent by U.S. Mail, the bidder or proposer shall be responsible for its timely delivery to the Purchasing Division. Bids or proposals delayed by mail shall not be considered, shall not be opened at the public opening, and arrangements shall be made for their return at the respondent's request and expense.

A.05 DEADLINE FOR CLARIFICATION REQUESTS

March 10, 2009 at 10:00 A.M. shall be the deadline to submit all inquiries, suggestions, or requests concerning interpretation, clarification or additional information pertaining to the Invitation for Bids or the Request For Proposals to the Manatee County Purchasing Office.

This deadline has been established to maintain fair treatment for all potential bidders, while maintaining the expedited nature of the Economic Stimulus that the contracting of this work may achieve.

A.06 CLARIFICATION & ADDENDA

relating to the adequacy and accuracy of such documents. Any inquiries, suggestions or requests concerning interpretation, clarification or additional information pertaining to the Invitation For Bid shall be made through the Manatee County Purchasing Office. The County shall not be responsible for oral interpretations given by any County employee, representative, or others. The issuance of a written addendum is the only official method whereby interpretation, clarification or additional information can be given.

If any addenda are issued to this Invitation For Bid, the County will BROADCAST THE ADDENDA ON ONVIA DEMANDSTAR TO "PLANHOLDERS" IDENTIFIED ON THIS WEB SERVICE; however, it shall be the responsibility of each bidder, prior to submitting their bid, to contact the Manatee County Purchasing Office (see contact information on page 1) to determine if addenda were issued and to make such addenda a part of their bid.

A.07 SEALED & MARKED

Three signed copies of your bid shall be submitted in one sealed package, clearly marked on the outside "Sealed Bid #09-0834DC SWRWTP Administration Building Renovations with your company name.

Address package to: Manatee County Purchasing Division
 1112 Manatee Avenue West, Suite 803
 Bradenton, Florida 34205

A.08 **LEGAL NAME**

Bids or proposals shall clearly indicate the legal name, address and telephone number of the bidder or proposer. Bids or proposals shall be signed above the typed or printed name and title of the signer. The signer must have the authority to bind the bidder or proposer to the submitted bid or proposal.

A.09 **BID AND PROPOSAL EXPENSES**

All expenses for making bids or proposals to the County are to be borne by the bidder.

A.10 **IRREVOCABLE OFFER**

Any bid may be withdrawn up until the date and time set for opening of the bid. Any bid not so withdrawn shall, upon opening, constitute an irrevocable offer for a period of 90 days to sell to Manatee County the goods or services set forth in the attached specifications until one or more of the bids have been duly accepted by the County.

A.11 **DISCLOSURE**

Upon receipt, all inquires and responses to inquires related to this Invitation For Bid or Request For Proposal become "Public Records" and are subject to public disclosure consistent with Chapter 119, Florida Statutes.

Bids become "Public Records" ten (10) days after the proposal opening or if an award decision is made earlier than this time as provided by Florida Statute 119.071. No announcement or review of the bid documents shall be conducted at the public opening of the proposals.

A.12 **RESERVED RIGHTS**

The County reserves the right to accept or reject any and/or all bids, to waive irregularities and technicalities, and to request resubmission. Also, the County reserves the right to accept all or any part of the bid and to increase or decrease quantities to meet additional or reduced requirements of the County. Any sole response received by the first submission date may or may not be rejected by the County depending on available competition and current needs of the County. For all items combined, the bid of the lowest responsive, responsible bidder will be accepted, unless all bids are rejected. The lowest responsible bidder shall mean that bidder who makes the lowest bid to sell goods and/or services of a quality which conforms closest to or most exceeds the quality of goods and/or services set forth in the attached specifications or otherwise required by the County, and who is fit and capable to perform the bid as made.

To be responsive, a bidder shall submit a bid which conforms in all material respects to the requirements set forth in the Invitation For Bid. To be a responsible bidder, the bidder shall have the capability in all respects to perform fully the contract requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance. Also, the County reserves the right to make such investigation as it deems necessary to determine the ability of any bidder to furnish the service requested. Information the County deems necessary to make this determination shall be provided by the bidder. Such information may include, but shall not be limited to: current financial statements, verification of availability of equipment and personnel, and past performance records.

A.13 APPLICABLE LAWS

Bidder or proposer must be authorized to transact business in the State of Florida. All applicable laws and regulations of the State of Florida and ordinances and regulations of Manatee County will apply to any resulting agreement. Any involvement with any Manatee County procurement shall be in accordance with Manatee County Purchasing Code Ordinance 08-43, as amended. Any actual or prospective bidder or proposer who is aggrieved in connection with the solicitation or award of a contract may protest to the Board of County Commissioners of Manatee County as required in Section 2-26/61 of the Purchasing Code.

A protest with respect to this Invitation For Bid or Request for Proposal shall be submitted in writing prior to the scheduled opening date of this bid or proposal, unless the aggrieved person did not know and could not have been reasonably expected to have knowledge of the facts giving rise to such protest prior to the scheduled opening date of this bid or proposal. The protest shall be submitted within seven calendar days after such aggrieved person knows or could have reasonably been expected to know of the facts giving rise thereto.

A.14 CODE OF ETHICS

With respect to this bid or proposal, if any bidder or proposer violates or is a party to a violation of the Code of Ethics of Manatee County per Manatee County Purchasing Code Ordinance 08-43, Article 3, Ethics in Public Contracting, and/or the State of Florida per Florida Statutes, Chapter 112, Part III, Code of Ethics for Public Officers and Employees, such bidder or proposer may be disqualified from performing the work described in this bid or proposal or from furnishing the goods or services for which the bid or proposal is submitted and shall be further disqualified from submitting any future bids or proposals for work or for goods or services for Manatee County.

The County anticipates that all statements made and materials submitted in a bid or proposal will be truthful. If a bidder or proposer is determined to be untruthful in its bid or proposal or any related presentation, such bidder or proposer may be disqualified from further consideration regarding this Invitation For Bid or Request For Proposal.

A.15 COLLUSION

By offering a submission to this Invitation For Bid or Request for Proposal, the bidder or proposer certifies that he has not divulged, discussed or compared their bid or proposal with other bidder or proposer, and has not colluded with any other bidder or proposer or parties to this bid or proposal whatsoever. Also, bidder or proposer certifies, and in the case of a joint bid or proposal each party thereto certifies as to their own organization, that in connection with this bid:

- a. any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other bidder or with any competitor;
- b. any prices and/or cost data quoted for this bid or proposal have not been knowingly disclosed by the bidder or proposer and will not knowingly be disclosed by the bidder or proposer, prior to the scheduled opening, directly or indirectly to any other bidder or to any competitor;

A.15 COLLUSION (cont'd)

- c. no attempt has been made or will be made by the bidder or proposer to induce any other person or firm to submit or not to submit a bid or proposal for the purpose of restricting competition;
- d. the only person or persons interested in this bid or proposal, principal or principals is/are named therein and that no person other than therein mentioned has any interest in this bid or proposal or in the contract to be entered into; and
- e. no person or agency has been employed or retained to solicit or secure this contract upon an agreement or understanding or a commission, percentage, brokerage, or contingent fee excepting bona fide employees or established commercial agencies maintained by bidder or proposer for purpose of doing business.

A.16 BID OR PROPOSAL FORMS

Bids or proposals must be submitted on attached County forms, although additional pages may be attached. **Bidders or proposers must fully comply with all bid or proposal specifications, terms and conditions.** Failure to comply shall result in contract default, whereupon, the defaulting vendor shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by the County.

A.17 DISCOUNTS

Any and all discounts must be incorporated in the prices contained in the bid or proposal; and not shown separately. The prices as shown on the bid or proposal form shall be the price used in determining award(s).

A.18 TAXES

Manatee County is exempt from Federal Excise and State Sales Taxes. (F.E.T. Exempt Cert. No. 59-78-0089K; FL Sales Tax Exempt Cert. No. **51-02-027548-53C**); therefore, the vendor is prohibited from delineating a separate line item in his bid or proposal for any sales or service taxes. Nothing herein shall affect the vendor's normal tax liability.

A.19 MATHEMATICAL ERRORS

In the event of multiplication/extension error(s), the unit price shall prevail. In the event of addition error(s) the extension totals will prevail. All bids or proposals shall be reviewed mathematically and corrected, if necessary, using these standards, prior to additional evaluation.

A.20 DESCRIPTIVE INFORMATION

Unless otherwise specifically provided in the specifications, all equipment, materials and articles incorporated in the work covered by this contract shall be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in the specifications, reference to any equipment, material, article or patented process, by trade name, brand name, make or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

A.21 MODIFICATION OF BID OR PROPOSAL SPECIFICATIONS

If a bidder wishes to recommend changes to the bid or proposal specifications, the bidder or proposer shall furnish in writing, data and information necessary to aid the County in evaluating the request to modify the specifications. The County is not obligated to make any changes to the bid or proposal specifications. Unless an addendum is issued as outlined in paragraph A.05, six calendar days prior to the bid or proposal, the bid or proposal specifications shall remain unaltered. **Bidders or proposers must fully comply with the bid or proposal specifications, terms, and conditions.**

A.22 AMERICANS WITH DISABILITIES ACT

The Board of County Commissioners of Manatee County, Florida, does not discriminate upon the basis of any individual's disability status. This non-discrimination policy involves every aspect of the County's functions including one's access to, participation, employment, or treatment in its programs or activities. Anyone requiring reasonable accommodation for an **Information Conference or Bid or Proposal Opening**, should contact the person named on the first page of this bid or proposal document at least twenty four (24) hours in advance of either activity.

A.23 LOBBYING

After the issuance of any Invitation For Bid or Request For Proposal, prospective bidders, proposers or any agent, representative or person acting at the request of such bidder or proposer shall not contact, communicate with or discuss any matter relating in any way to the Invitation For Bid or Request For Proposal with any officer, agent or employee of Manatee County other than the Purchasing Director or as directed in the Invitation For Bid or Request For Proposal. This prohibition begins with the issuance of any Invitation For Bid or Request For Proposal, and ends upon execution of the final contract or when the invitation or request has been canceled. Violators of this prohibition shall be subject to sanctions as provided in the Manatee County Purchasing Code.

The County reserves the right to amend or to add to the names listed as persons to contact. All amendments or additions to the names listed as persons to contact shall be issued by the Purchasing Division, in writing.

A.24 DRUG FREE WORK PLACE

The Manatee County Board of County Commissioners adopted a policy regarding bidders or proposers maintaining a Drug Free Work Place, prohibiting the award of bids or proposals to any person or entity that has not submitted written certification to the County that it has complied with those requirements [Reference Resolution R-93-22, Manatee County Purchasing Policies, Section 4, E (1) (a)]. A Drug Free Work Place Certification Form is attached to this bid or proposal for this purpose.

A.25 PUBLIC ENTITY CRIMES

In accordance with Section 287.133, Florida Statutes, 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 or proposal on a contract to provide any goods or services to a public entity, may not submit a bid or proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids or proposals on leases or real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017 for Category Two (as of 1/01/2005 is \$25,000) for a period of 36 months from the date of being placed on the convicted vendor list.

A.26 PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

In accordance with Ordinance 08-43, adding Article 5, Manatee County Board of County Commissioners adopted a policy prohibiting the award of County contracts to persons, business entities, or affiliates of business entities who have not submitted written certification to the County that they have not been convicted of bribery, attempted bribery, collusion, restraints of trade, price fixing, and violations of certain environmental laws. A Non-Conviction Certification Form is attached for this purpose.

A.27 EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

Manatee County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 and the Regulations of the Department of Commerce (15 CFR, Part 8) issued pursuant to such Act, hereby notifies all vendors that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids or proposals in response to this advertisement and will not be discriminated against on the grounds of race, color or national origin in consideration for an award.

A.28 MBE/WBE

The State of Florida, Office of Supplier Diversity provides the certification process and the database for identifying certified MBE/WBE firms. This service may be directly accessed at: <http://www.osd.dms.state.fl.us/iframe.htm>

If you have any questions regarding this State service, please contact their office at (850) 487-0915.

NOTE: ANY OR ALL STATEMENTS CONTAINED IN THE FOLLOWING SECTIONS: BASIS OF AWARD, TERMS AND CONDITIONS OF THE CONTRACT, OR SPECIFICATIONS WHICH VARY FROM THE INFORMATION TO BIDDERS OR PROPOSERS, SHALL HAVE PRECEDENCE.

SECTION 00020
BASIS OF AWARD

B.01 BASIS OF AWARD

Award shall be to the most responsive, responsible bidder meeting specifications and having the lowest Total Bid Price for **Bid "A"** or the lowest Total Bid Price for **Bid "B"** for the requirements listed on the Bid Form for the Work as set forth in this Invitation For Bid. Bid Prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work in accordance with and in the manner set forth and described in this Bid Document to the County's satisfaction within the prescribed time. **Note: Inspection of the site is a prerequisite to be considered for award of this bid.**

Two schedules for Completion of the Work shall be considered. Each bid for completion by the specific stated time shall be offered as a separate Total Bid Price. The County has the sole authority to select the bid based on the Completion Time which is in the best interest of the County. Only one award shall be made.

In evaluating bids, the County shall consider the qualifications of the bidders; and if required, may also consider the qualifications of the subcontractors, suppliers, and other persons and organizations proposed. County may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work.

Whenever two or more bids are equal with respect to price, quality and service, the bid received from a local business shall be given preference in award. Whenever two or more bids which are equal with respect to price, quality and service are received, and both bids or neither of these bids are received from a local business, the award shall be determined by a chance drawing conducted by the Purchasing Division and open to the public.

Local business is defined as a business duly licensed and authorized to engage in the sale of goods and/or services to be procured, which has a place of business in Manatee County with full time employees at that location.

B.02 SUBCONTRACTORS

Subcontractors shall be bound by the terms and conditions of this contract insofar as it applies to their Work, but this shall not relieve the prime contractor from the full responsibility to the Owner for the proper completion of all Work to be executed under this contract.

The employment of unauthorized aliens by any vendor is considered a violation of Section 274(e) of the Immigration and Employment Act. If the vendor knowingly employs unauthorized aliens, such violation shall be cause for unilateral cancellation of this agreement.

B.03 QUALIFICATIONS OF BIDDERS

Each bidder must secure all licenses required (in accordance with Chapter 489 Florida Statutes) for the Work which is the subject of this bid; and, upon request, shall submit a true copy of all applicable licenses. **The minimum license requirement for this project is a General Contractor's License.**

To demonstrate qualifications to perform the Work, each bidder must be prepared to submit within five days of County's request, written evidence such as financial data, previous experience, present commitments and other such data as may be requested. Bidder must be able to provide evidence of bidder's qualification to do business in the State of Florida. Each bidder shall submit as a portion of their bid a completed Contractor's Questionnaire included as Section 00430.

A complete list of all subcontractors proposed for any portion of the Work may be requested of any bidder deemed necessary by the Owner. Subcontracts shall be awarded only to those subcontractors considered satisfactory by the Owner.

B.04 PREPARING CONTRACT

A written notice confirming award or recommendation thereof will be forwarded to the successful bidder accompanied by the required number of unsigned counterparts of the agreement. Within ten (10) days thereafter, successful bidder shall sign and deliver the required number of counterparts of the agreement with any other required documents to County. (Note: Contract must be approved and executed by Manatee County Board of County Commissioners to be valid.)

SECTION 00030
GENERAL TERMS AND CONDITIONS OF THE CONTRACT

C.01 CONTRACT FORMS

The agreement resulting from the acceptance of a bid shall be in the form of the agreement stated in this bid.

C.02 ASSIGNMENT OF CONTRACT

Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this contract or of his right, title, or interest therein, or his power to execute such contract, or to assign any monies due or to become due thereunder to any other person, firm or corporation unless first obtaining the written consent of the County. The giving of such consent to a particular subcontractor assignment shall not dispense with the necessity of such consent to any further or other assignment.

C.03 COMPLETION OF WORK

The Work will be substantially complete and ready for occupancy within the specific calendar days from the date the Contract Time commences to run (upon issuance of Notice to Proceed). Two bids shall be considered based on **360** calendar days and based on **320** calendar days. The County has the sole authority to select the bid based on the Completion time which is in the best interest of the County. Only one award shall be made.

C.04 LIQUIDATED DAMAGES

If the contractor refuses or fails to prosecute the Work, or any separable part thereof, with such diligence as will hinder its completion within the time specified, the County may seek damages. The actual damages for delay will be impossible to determine and in lieu thereof, the contractor shall pay to the Owner the sum of **\$715** as fixed, agreed, and liquidated damages for each calendar day of the delay until the Work is finally accepted by the County and the contractor and his Surety shall be liable for the amount thereof.

C.05 PAYMENT

Contractor may apply for partial payment on monthly estimates, based on the amount of Work done or completed in compliance with the provisions of the contract. Contractor shall submit an application, on a form provided or approved by the County, of an approximate estimate of the proportionate value of the Work done, items and locations of the Work performed up to and including the last day of the period then ending. The County will then review said estimate and make any necessary revisions so that the estimate can receive approval for payment. If the contractor and the County do not agree on the approximate estimate of the proportionate value of the Work done for any pay period, the determination of the County will be binding. The amount of said estimate after deducting any required retainage and all previous payments shall be due and payable to the contractor within 20 days after the pay estimate has been approved by the County. Any Periodical Pay Estimate signed by the contractor shall be final as to the contractor for any or all work covered by the Periodical Pay Estimate. It is the contractor's responsibility for the care of any stored materials. Any damage to or loss of said materials is the responsibility of the contractor.

00030-1

C.05 PAYMENT (cont'd)

Any requests for payment of materials stored on site must be accompanied with a paid receipt. The contractor warrants and guarantees that title to all work, materials and equipment covered by any application for payment, whether incorporated in the project or not, will pass to the County at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter referred to as "Liens").

The contractor agrees to furnish an affidavit stating that all laborers, materialmen, and subcontractors have been paid on the project for Work covered by the application for payment and that a partial or complete release of lien, as may be necessary, be properly executed by the materialmen, laborers, subcontractors on the project for Work covered by the application for payment, sufficient to secure the County from any claim whatsoever arising out of the aforesaid Work.

When the contractor has completed the Work in compliance with the terms of the Contract Documents, he shall notify the County in writing that the project is ready for final inspection. The County will then advise the contractor as to the arrangements for final inspection and what Work, if any, is required to prepare the project or a portion thereof for final inspection. When the County determines the project or portion thereof is ready for final inspection, the County shall perform same. Upon completion of final inspection, the County will notify contractor of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies. When all such errors have been corrected, a final reinspection will be made. The process will be repeated until, in the opinion of the County, the project has been completed in compliance with the terms of the Contract Documents.

When final acceptance has been made by the County, the County will make final payment of the contract amount, plus all approved additions, less approved deductions and previous payments made. The contract will be considered complete when all work has been finished, the final inspection made, approved as-builts received, and the project finally accepted in writing by the County. The contractor's responsibility shall then terminate except as otherwise stated.

C.06 RETAINAGE

A **retainage** of 2.5% of the total contract amount shall be withheld from payments after 75% completion of the Work. Upon substantial completion, this retainage shall be reduced to 1% of the total contract amount plus such amount as the Owner may reasonably deem necessary to repair, replace, complete or correct any damaged, defective, incorrect or incomplete work. Upon final acceptance, the remaining retainage shall be included in the final payment.

C.07 WARRANTY AND GUARANTEE PROVISIONS

All work, materials, and equipment furnished as defined herein shall be guaranteed and warranted by the contractor for a minimum period of three (3) years from final acceptance by the Owner, unless otherwise specified, to be free from defects due either to faulty materials or equipment or faulty workmanship. All materials,

C.07 WARRANTY AND GUARANTEE PROVISIONS (cont'd)

equipment, and workmanship furnished and installed by the contractor is warranted and guaranteed by the contractor to be such as to meet the required standards and to accomplish the purposes and functions of the project as defined, detailed, and specified herein. The Owner shall, following discovery thereof, promptly give written notice to the contractor of faulty materials, equipment, or workmanship within the period of the guarantee and the contractor shall promptly replace any part of the faulty equipment, material, or workmanship at his own cost. These warranty and guarantee provisions create no limitations on the Owner as to any claims or actions for breach of guaranty or breach of warranty that the Owner might have against parties other than the contractor, and do not constitute exclusive remedies of the Owner against the contractor.

C.08 ROYALTIES AND PATENTS

The contractor shall pay all royalties and license fees for equipment or processes in conjunction with the equipment and/or services being furnished. Contractor shall defend all suits or claims for infringement of any patent, trademark or copyright, and shall save the County harmless from loss on account thereof, including costs and attorney's fees.

C.09 AUTHORIZED PRODUCT REPRESENTATION

The contractor, by virtue of submitting the name and specifications of a manufacturer's product, will be required to furnish the named manufacturer's product. Failure to perform accordingly may, in the County's sole discretion, be deemed a breach of contract, and shall constitute grounds for the County's immediate termination of the contract.

C.10 REGULATIONS

It shall be the responsibility of the bidder to assure compliance with any OSHA, EPA and/or other federal or State of Florida rules, regulations or other requirements, as each may apply.

C.11 CANCELLATION

Any failure of the contractor to furnish or perform the Work (including, but not limited to, commencement of the Work, failure to supply sufficient skilled workers or suitable materials or equipment) in accordance with the contract, the County may order the stop of the Work, or any portion thereof, until the cause for such order has been eliminated. If the contractor persistently fails to perform the Work in accordance with the contract, the County reserves the right to terminate the contract and select the next qualified bidder or readvertise this procurement in part or in whole. The County reserves the right to cancel all or any undelivered or unexecuted portion of this contract with or without cause.

C.12 INDEMNIFICATION

The contractor covenants and agrees to indemnify and save harmless the County, its agents and employees, from and against all claims, suits, actions, damages, causes of action, or judgments arising out of the terms of the resulting agreement for any personal injury, loss of life, or damage to the property sustained as a result of the performance or non-performance of services or delivery of goods; from and

00030-3

C.12 INDEMNIFICATION (cont'd)

against any orders, judgments, or decrees, which may be entered against the County, its agents or employees; and from and against all costs, attorney's fees, expenses and other liabilities incurred in the defense of any such claim, suit or action, and the investigation thereof. Nothing in the award, resulting agreement, contract or Purchase Order shall be deemed to affect the rights, privileges and immunities of the County as set forth in Florida Statute Section 768.28.

C.13 MANUALS, SCHEMATICS, HANDBOOKS

All manuals, schematics and handbooks shall be provided which are applicable to the equipment delivered. An operators manual, parts manual and technician manual must also be provided. Parts lists (manuals) must include OEM part numbers for items not manufactured by the bidder. Vendor shall furnish two (2) copies of each.

C.14 INSURANCE

The contractor will not commence work under a contract until all insurance under this section and such insurance coverage as might be required by the County has been obtained. The contractor shall obtain, and submit to Purchasing within 15 calendar days of request, at his expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy):

a. Workers' Compensation/Employers' Liability

Part One - There shall be no maximum limit (other than as limited by the applicable statute) for liability imposed by Florida Worker's Compensation Act or any other coverage required by the contract documents which are customarily insured under Part One of the standard Worker's Compensation Policy.

Part Two - The minimum amount of coverage required by the contract documents which are customarily insured under Part Two of the standard Workers' Compensation Policy shall be:

<u>\$100,000</u>	(Each Accident)
<u>\$500,000</u>	(Disease-Policy Limit)
<u>\$100,000</u>	(Disease-Each Employee)

b. Commercial General Liability

The limits are to be applicable only to work performed under this contract and shall be those that would be provided with the attachment of the Amendment of Limits of Insurance (Designated Project or Premises) endorsement (ISO Form CG 25 03) to a Commercial General Liability Policy with the following minimum limits.

General Aggregate:

Products/Completed Operations Aggregate	<u>\$1,000,000</u>
Personal and Advertising Injury	<u>\$300,000</u>
Each Occurrence	<u>\$300,000</u>
Fire Damage (Any One Fire)	\$ Nil
Medical Expense (Any One Person)	\$ Nil

C.14 INSURANCE (cont'd)c. Business Auto Policy

Each Occurrence Bodily Injury and		
Property Damage Liability Combined	\$300,000	
Annual Aggregate (if applicable):	<u>\$1,000,000</u>	

d. Owners Protective Liability Coverage

The minimum OPC Policy limits per occurrence and, if subject to an aggregate, annual aggregate to be provided by the contractor shall be the same as the amounts shown above as the minimum per occurrence and general policy aggregate limits respectively required for the Commercial General Liability coverage. The limits afforded by the OPC Policy and any excess policies shall apply only to the Owner and the Owner's officials, officers, agents and employees and only to claims arising out of or in connection with the work under this contract.

e. Property Insurance

If this contract includes construction of or additions to above ground buildings or structures, contractor shall provide "Builder's Risk" insurance with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

f. Installation Floater

If this contract does not include construction of or additions to above ground building or structures **but does involve** the installation of machinery or equipment, contractor shall provide an "Installation Floater" with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s).

g. Certificates of Insurance and Copies of Policies

Certificates of Insurance in triplicate evidencing the insurance coverage specified in the six above paragraphs a., b., c., d., e. and f., shall be filed with the Purchasing Director before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the bid number, project title and location of project. Insurance shall remain in force at least one year after completion and acceptance of the project by the County, in the amounts and types as stated herein, with coverage for all products and services completed under this contract.

ADDITIONAL INSURED: - The contractor shall name Manatee County as additional insured in each of the applicable policies.

If the initial insurance expires prior to the completion of operations and/or services by the contractor, renewal certificates of insurance and required copies of policies

C.14 INSURANCE (cont'd)

shall be furnished by the contractor and delivered to the Purchasing Director 30 days prior to the date of their expiration.

Nothing herein shall in any manner create any liability of the County in connection with any claim against the contractor for labor, services, or materials, or of subcontractors; and nothing herein shall limit the liability of the contractor or contractor's sureties to the County or to any workers, suppliers, materialmen or employees in relation to this contract.

C.15 BID BOND/CERTIFIED CHECK

By offering a submission to this Invitation For Bid the bidder agrees, should the bidder's bid be accepted, **to execute the form of contract and present the same to Manatee County for approval within ten (10) days after being notified of the awarding of the contract.** The bidder further agrees that failure to execute and deliver said form of contract within 10 days will result in damages to Manatee County and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed bid in the amount of five (5%) percent of the total amount of the bid. The bidder further agrees that in case the bidder fails to enter into a contract, as prescribed by Manatee County, the bid bond/certified check accompanying the bid shall be forfeited to Manatee County as agreed liquidated damages. If the County enters into a contract with a bidder, or if the County rejects any and/or all bids, accompanying bond will be promptly returned.

C.16 PERFORMANCE AND PAYMENT BONDS

The successful bidder shall furnish surety bonds as security for faithful performance of the contract awarded as a result of this bid, and for the payment of all persons performing labor and/or furnishing material in connection therewith. Surety of such bonds shall be in an amount equal to the bid award (100% each) and from a duly authorized and nationally recognized surety company, authorized to do business in Florida, satisfactory to this County. The attorney-in-fact who signs the bonds must file with the bonds a certificate and effective dated copy of power-of-attorney. (Reference Florida Statute 255.05)

Furnishing the performance and payment bonds shall be requisite to execution of a contract with the County. Said performance and payment bonds will remain in force for the duration of the contract with the premiums paid by the contractor. Failure of successful bidder to execute such contract and to supply the required bonds shall be just cause for annulment of the award. The County may then contract with another acceptable bidder or readvertise this Invitation For Bid. If another bidder is accepted, and notice given within 90 days after the opening of bids, this acceptance shall bind the bidder as though they were originally the successful bidder.

Failure of the County at any time, to require performance by the contractor of any provisions set out in the contract will in no way affect the right of the County, thereafter, to enforce the provisions. Bonds to remain in effect for one year after final payment becomes due.

C.17 PROJECT SCHEDULE

The successful bidder will be required to submit a detailed construction schedule upon notification of award or its intent.

C.18 NO DAMAGES FOR DELAY

No claim for damages or any claim other than for an extension of time shall be made or asserted against the County by reason of any delays. The contractor shall not be entitled to an increase in the Total Contract Price or payment or compensation of any kind from the County or direct, indirect, consequential impact or other costs, expenses for damages, including but not limited to costs of acceleration or inefficiency arising because of delay, disruption, interference or hindrance from any cause whatsoever; provided, however, that this provision shall not preclude recovery or damages by the contractor for hindrance or delays due solely to fraud, bad faith, or active interference on part of the County or its agents. Otherwise, the contractor shall only be entitled to extensions of the Contract Time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent specifically provided above.

C.19 NO INTEREST

Any monies not paid by the County when claimed to be due to the contractor under this contract shall not be subject to interest including prejudgment interest. Any monies not paid by the County when claimed to be due to the contractor for damages awarded in the case of construction delays shall not be subject to prejudgment interest.

C.20 CONSTRUCTION OF CONTRACT

This contract and the rights and responsibilities hereunder shall not be construed more strongly against either party, regardless of the extent to which such party may have participated in the preparation hereof.

SECTION 00100
INSTRUCTIONS TO BIDDERS

D.01 THE WORK

The Work is generally described as the partial renovation of approximately 2,500 square feet of the old laboratory area within the existing Administration Building at the Southwest Regional Wastewater Treatment Plant, including remodeling with associated architectural, mechanical, electrical, and plumbing work as outlined in this Invitation for Bid document. Construction and record drawings are required of the successful bidder and shall fully meet the requirements of all current federal, state and county laws, rules, regulations and standards, with the most stringent applying.

D.02 SUBCONTRACTORS, SUPPLIERS AND OTHERS

The identity of subcontractors, suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) may be requested by the Owner for each bid item from any of the bidders; and the bidder shall respond within five days after the date of such request. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such subcontractor, supplier, persons or organization if requested by Owner. If Owner, after due investigation has reasonable objection to any proposed subcontractor, supplier, other person or organization, Owner may request the apparent successful bidder to submit an acceptable substitute without an increase in Contract Price or Contract Time.

If apparent successful bidder declines to make any such substitution, Owner may award the contract to the next lowest qualified bidder that proposes to use acceptable subcontractors, suppliers, and other persons who Owner does not make written objection to. Contractor shall not be required to employ any subcontractor, supplier, other person or organization who contractor has reasonable objection to. Subcontractors shall be bound by the terms and conditions of this contract insofar as it applies to their Work, but this shall not relieve the prime contractor from the full responsibility to the Owner for the proper completion of all Work to be executed under this contract.

D.03 BIDS

Bids are to be submitted in triplicate, one original and two copies, upon the County supplied forms. All blank spaces must be filled in as noted with amounts extended and totaled and no changes shall be made in the wording of the forms or in the items mentioned therein. In the event a change is made in your submittal, the bidder shall write their initials by the change. Any bid may be rejected which contains any omissions, alterations, irregularities of any kind, or which shall in any manner fail to conform to bid requirements.

D.03 BIDS (cont'd)

A bid made by an individual, either in his/her own or proper person or under a trade or firm name, shall be executed under the individual's signature. If made by a partnership, the bid shall be executed by two or more of the general partners. If made by a corporation, the bid shall be executed by its President or other legally authorized corporate officer or agent.

D.04 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

It is the responsibility of each bidder before submitting a bid, to (a) examine the Bid Documents thoroughly; (b) visit the site to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work; (c) consider federal, state, and local codes, laws, and regulations that may affect costs, progress, performance, or furnishing of the Work; (d) study and carefully correlate bidder's observations with the Bid Documents; and (e) notify Owner of all conflicts, errors, or discrepancies in the Bid Document. The accuracy of the existing utility locations shown on the plans is approximate and without expressed or implied warranty. Each bidder may, at bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work and which bidder deems necessary to determine his bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

Owner will provide each bidder access to the site to conduct such explorations and tests. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

D.05 OWNER ALLOWANCE No.1

The Owner's Allowance specifically relates to the County-furnished items Manatee County has in its inventory as specified in the respective Specification Section. Approved payment(s) from this item shall be for items that may be missing or damaged from the inventory list. The Allowance is for additional material cost only. All labor is to be included within the respective Bid Item.

SECTION 00300
BID FORM
(Submit in Triplicate)

For: SWRWTP Administration Building Renovations

TOTAL BID PRICE: \$ _____ based on **completion time of 360** calendar days.

TOTAL BID PRICE: \$ _____ based on **completion time of 320** calendar days.

Two schedules for Completion of the Work shall be considered. Each bid for completion by the specified stated time shall be offered as a separate "Total Bid Price." The County has the sole authority to select the bid based on the Completion Time which is in the best interest of the County. Only one award shall be made.

We, the undersigned, hereby declare that we have carefully reviewed the Bid Documents and with full knowledge and understanding of the aforementioned herewith submit this bid, meeting each and every specification, term, and condition contained in the Invitation For Bid.

We understand that the bid specifications, terms, and conditions in their entirety shall be made a part of any agreement or contract between Manatee County and the successful bidder. Failure to comply shall result in contract default, whereupon, the defaulting contractor shall be required to pay for any and all reprocurement costs, damages, and attorney fees as incurred by the County.

Communications concerning this Bid shall be addressed as follows:

Person's Name: _____

Address: _____ Phone: _____

Date: _____ Date you visited site: _____

Company's Name: _____

Authorized Signature(s): _____

Name and Title of Above Signer(s)

Company Mailing Address: _____

Email address: _____

Telephone: (____) _____ Fax: (____) _____

Acknowledge Addendum Nos. _____ Dated: _____

SECTION 00300
BID FORM

For: SWRWTP Administration Building Renovations

ITEM	DESCRIPTION – BID “A” 360 COMPLETION DAYS	LUMP SUM
1.	Mobilization	\$
2.	Construct Building Renovations Complete	\$
3.	Miscellaneous Work and Cleanup	\$
4.	Discretionary Work	\$ 50,000.00
5.	Permit Fees	\$ 1,390.00
6.	Owner Allowance No.1	\$ 25.000.00
	TOTAL BID PRICE – BID “A”	\$

ITEM	DESCRIPTION – BID “B” 320 COMPLETION DAYS	LUMP SUM
1.	Mobilization	\$
2.	Construct Building Renovations Complete	\$
3.	Miscellaneous Work and Cleanup	\$
4.	Discretionary Work	\$ 50,000.00
5.	Permit Fees	\$ 1,390.00
6.	Owner Allowance No.1	\$ 25.000.00
	TOTAL BID PRICE – BID “B”	\$

SECTION 00430
CONTRACTOR'S QUESTIONNAIRE
(Submit in Triplicate)

The bidder warrants the truth and accuracy of all statements and answers herein contained. (Include additional sheets if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID.

1. LICENSE # and COMPANY'S NAME: _____
CO. PHYSICAL ADDRESS: _____
STATE OF INCORPORATION, IF APPLICABLE: _____
TELEPHONE NUMBER: (_____) _____ FAX: (_____) _____
2. Bidding as an individual: ____; a partnership: ____; a corporation: ____; a joint venture: ____
3. If a partnership: list names and addresses of partners; if a corporation: list names of officers, directors, shareholders, and state of incorporation; if joint venture: list names and address of venturers and the same if any venturer is a corporation for each such corporation, partnership, or joint venture:

4. Your organization has been in business (under this firm's name) as a _____
for how many years? _____
5. Describe and give the date and owner of the last three government projects you've completed which are similar in cost, type, size, and nature as the one proposed (for a public entity). Include contact name and phone number:

6. Have you ever been assessed liquidated damages under a contract during the past five (5) years? If so, state when, where (contact name, address, and phone number) and why.

7. Have you ever failed to complete work awarded to you? If so, state when, where (contact name, address, phone number) and why?

8. Have you ever been debarred or prohibited from bidding on a governmental entity's construction project? If yes, name the entity and describe the circumstances:

9. Name three individuals, governmental entities, or corporations for which you have performed similar work and to which you refer. Include contact name and phone number:

1. _____

2. _____

3. _____

10. What specific steps have you taken to examine the physical conditions at or contiguous to the site, including but not limited to, the location of existing underground facilities? Have you visited the site? _____

11. What specific physical conditions, including, but not limited to, the location of existing underground facilities have you found which will, in any manner, affect cost, progress, performance, or finishing of the work?

12. Will you subcontract any part of this Work? If so, describe which major portion(s):

13. If any, list (with contract amount) WBE/MBEs to be utilized:

14. What equipment do you own to accomplish this Work?

15. What equipment will you purchase/rent for the Work? (specify which)

16. List the following in connection with the Surety which is providing the Bond(s):

Surety's Name: _____

Surety's Address: _____

Name, address and phone number of Surety's resident agent for service of process in Florida:

Phone: (_____) _____

SECTION 00491

Drug Free Work Place Certification

SWORN STATEMENT PURSUANT TO RESOLUTION R-01-36 SECTION 4, E (1) (a)
MANATEE COUNTY PURCHASING POLICIES, ON DRUG FREE WORK PLACES

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

This sworn statement is submitted to the Manatee County Board of County Commissioners by _____

[print individual's name and title]

for _____

[print name of entity submitting sworn statement]

whose business address is: _____

and (if applicable) its Federal Employer Identification Number (FEIN) is _____ (If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____.)

I understand that no person or entity shall be awarded or receive a county contract for public improvements, procurement of goods or services (including professional services) or a county lease, franchise, concession or management agreement, or shall receive a grant of county monies unless such person or entity has submitted a written certification to the County that it will provide a drug free work place by:

(1) providing a written statement to each employee notifying such employee that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance as defined by §893.02(4), Florida Statutes, as the same may be amended from time to time, in the person's or entity's work place is prohibited specifying the actions that will be taken against employees for violation of such prohibition. Such written statement shall inform employees about:

- (i) the dangers of drug abuse in the work place;
- (ii) the person's or entity's policy of maintaining a drug free environment at all its work places, including but not limited to all locations where employees perform any task relating to any portion of such contract, business transaction or grant;
- (iii) any available drug counseling, rehabilitation, and employee assistance programs; and
- (iv) the penalties that may be imposed upon employees for drug abuse violations.

(2) Requiring the employee to sign a copy of such written statement to acknowledge his or her receipt of same and advice as to the specifics of such policy. Such person or entity shall retain the statements signed by its employees. Such person or entity shall also post in a prominent place at all of its work places a written statement of its policy containing the foregoing elements (i) through (iv).

(3) Notifying the employee in the statement required by subsection (1) that as a condition of employment the employee will:

- (i) abide by the terms of the statement; and
- (ii) notify the employer of any criminal drug statute conviction for a violation occurring in the work place no later than five (5) days after such a conviction.

00491-1

- (4) Notifying the County within ten (10) days after receiving notice under subsection (3) from an employee or otherwise receiving actual notice of such conviction.
- (5) Imposing appropriate personnel action against such employee up to and including termination; or requiring such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a federal, state, or local health, law enforcement, or other appropriate agency.
- (6) Making a good faith effort to continue to maintain a drug free work place through implementation of sections (1) through (5) stated above.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY CONTRACT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR THE COUNTY ADMINISTRATOR DETERMINES THAT:

- (1) Such person or entity has made false certification.
- (2) Such person or entity violates such certification by failing to carry out the requirements of sections (1), (2), (3), (4), (5), or (6) or Resolution R-01-36 Section 4, E (1) (a) or
- (3) Such a number of employees of such person or entity have been convicted of violations occurring in the work place as to indicate that such person or entity has failed to make a good faith effort to provide a drug free work place as required by Resolution R-01-36 Section 4, E (1) (a).

[Signature]

STATE OF FLORIDA
COUNTY OF _____

Sworn to and subscribed before me this _____ day of _____, 200____ by _____.

Personally known _____ OR Produced identification _____
[Type of identification]

Notary Public Signature

My commission expires _____

[Print, type or stamp Commissioned name of Notary Public]

00491-2

SECTION 00491

PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE 6,
MANATEE COUNTY PURCHASING CODE

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

This sworn statement is submitted to the Manatee County Board of County Commissioners by _____
[print individual's name and title]

for _____
[print name of entity submitting sworn statement]

whose business address is: _____

and (if applicable) its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____

I understand that no person or entity shall be awarded or receive a county contract for public improvements, procurement of goods or services (including professional services) or a county lease, franchise, concession or management agreement, or shall receive a grant of county monies unless such person or entity has submitted a written certification to the County that it has not:

- (1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or
- (2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or
- (3) been convicted of a violation of an environmental law that, in the sole opinion of the County's Purchasing Director, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or
- (4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or
- (5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction, shall prove the same with documentation satisfactory to the County's Purchasing Director. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with the County.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY CONTRACT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR THE COUNTY ADMINISTRATOR DETERMINES THAT SUCH PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.

STATE OF FLORIDA
COUNTY OF _____

Sworn to and subscribed before me this _____ day of _____, 20____ by _____.
Personally known _____ OR Produced identification _____

[Type of identification]

My commission expires _____

Notary Public Signature

[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

**FORM OF AGREEMENT
BETWEEN THE
COUNTY OF MANATEE, FLORIDA
AND THE CONTRACTOR AS IDENTIFIED BELOW
ON THE BASIS OF A STIPULATED UNIT COST CONTRACT PRICE**

THIS AGREEMENT is made and entered into by and between the COUNTY OF MANATEE, a political subdivision of the State of Florida, hereinafter referred to as the "OWNER" and _____ hereinafter referred to as the "CONTRACTOR," duly authorized to transact business in the State of Florida, with offices located at _____.

Article 1. WORK

CONTRACTOR shall furnish all labor, materials, supplies, and other items required to complete the Work for IFB No. **09-0834DC Southwest Regional Wastewater Treatment Plant (SWRWTP) Administration Building Renovations** in strict accordance with specifications and any duly authorized subsequent addenda thereto, all of which are made a part hereof.

Article 2. ENGINEER

The County of Manatee, Project Management Division, is responsible as the OWNER and URS Corporation, hereinafter referred to as "ENGINEER," designed this project and is responsible for technical/engineering reviews and decisions. The ENGINEER is a member of the OWNER'S project management team which is collectively responsible in ensuring the Work is completed in accordance with the Contract Documents. All communications involving this project will be addressed to:

County of Manatee
Project Management Division
Attn: Sal Bordonaro, Project Manager
IFB 09-0834DC
1026 26th Avenue East
Bradenton, Florida, 34208
Phone: 941/708-7450

URS Corporation
Attn: Terrance J. Short, AIA
7650 W Courtney Campbell Cswy
Tampa, Florida 33607
Phone: 813/636-2198

Where the terms ENGINEER and/or OWNER are used in the Contract Documents, it shall mean the OWNER'S project management team.

Article 3. CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- 3.1 CONTRACTOR has familiarized itself with the nature and extent of the Bid Documents, Work, site, locality and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
- 3.2 CONTRACTOR has studied carefully all drawings of the physical conditions upon which CONTRACTOR is entitled to rely.
- 3.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies which pertain to the physical conditions at or contiguous to the site or which otherwise may affect the cost, progress, performance or furnishing of the Work as CONTRACTOR considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Bid Documents; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.
- 3.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Bid Documents with respect to existing underground facilities at or contiguous to the site and assumes responsibility for the accurate location of said underground facilities. Any additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said underground facilities conducted by the CONTRACTOR will be done at the CONTRACTOR's expense.
- 3.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Bid.
- 3.6 CONTRACTOR has given OWNER written notice of all conflicts, errors or discrepancies that have been discovered in the Bid Documents and the written resolution thereof by OWNER is acceptable to CONTRACTOR.

3.7 CONTRACTOR shall schedule and perform the Work subject to OWNER's approval and shall hold OWNER harmless from all liabilities incurred due to CONTRACTOR's failure to coordinate with the OWNER.

Article 4. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire Agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 4.1 This Agreement and Bid Document IFB #09-0834DC
- 4.2 Performance and/or other Bonds and Insurance Certificate(s)
- 4.3 Drawings (attached by reference)
- 4.4 Addenda numbers ____ to ____, inclusive.
- 4.5 CONTRACTOR's Bid Form and any other information submitted by Contractor prior to Notice of Award.
- 4.6 The following which may be delivered or issued after the effective date of the Agreement and are not attached hereto: all written Change Orders and other documents amending, modifying, or supplementing the Contract Documents.
- 4.7 The documents listed in paragraphs above are attached to this Agreement (except as noted otherwise above). There are no Contract Documents other than those listed above in this Article 4.

Article 5. MISCELLANEOUS

- 5.1 Terms used in this Agreement are defined in Article 1 of the General Conditions.
- 5.2 No assignment by a party hereto of any rights under or interest in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignee from any duty or responsibility under the Contract Documents.

5.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

The OWNER will pay, and the CONTRACTOR will accept in full consideration for the performance of the Work (IFB No. 09-0834DC **Southwest Regional Wastewater Treatment Plant Administration Building Renovations**), subject to additions and deductions as provided therein, the sum of _____ Dollars and _____ Cents (\$) _____ for Bid "___" based on Completion Time of ___ calendar days and the sum of \$___ as liquidated damages for each calendar day of delay.

CONTRACTOR

BY:

Signature

Type Name and Title of Signer

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

(impress official seal)

Notary Public, State of Florida

My commission expires: _____

APPROVED, with a quorum present and voting this ___ day of _____, 20_____.

ATTEST: R.B. SHORE
Clerk of the Circuit Court

COUNTY OF MANATEE, FLORIDA by its
Board of County Commissioners

BY: _____
CHAIRMAN

APPLICATION FOR PAYMENT

Project: _____ From: _____ To: _____

Request No. _____ Project No. _____
 Purchase Order Number: _____
 County Bid No.: _____
 Consultant: _____

CONTRACT PAYMENT SUMMARY

Original contract amount:	\$		
Change order(s):			
Change order summary:			
Number	Date Approved	Additive	Deductive
SUBTOTALS:			
Net change order subtotal (Additive less Deductive):	\$		
Current Contract Amount (CCA) (Original Amount + Change Order(s))	\$		
	Previous Status	Current Status	
Value of the Work in Place	\$	\$	
Value of Stored Materials	\$	\$	
Total Earned (\$ and % of CCA)	\$	\$ %	
Retainage (\$ and % of CCA)	\$	\$ %	
Net Earned (Total earned minus retainage)	\$		
TOTAL PREVIOUS PAYMENTS	\$		
AMOUNT DUE THIS PAYMENT (Net Earned minus Previous Payments)	\$		

CONTRACTOR'S AFFIDAVIT OF NOTICE

CERTIFICATE: The undersigned CONTRACTOR certifies that all items and amounts shown on this application for payment are on account of work performed, materials supplied and/or materials stored on site and paid for by Contractor in accordance with the Contract Documents with due consideration for previous Payment(s), if any, received by the Contractor from the County, and that the current payment shown is now due.

NOTARY:

CONTRACTOR:

State of Florida County of _____ Signature: _____ Name of person authorized to sign Affidavit of Notice
 Sworn to (or affirmed) and subscribed before me
 this _____ day of _____, _____, by _____
 TITLE

(Name of person giving notice)

Contractor name, address and telephone No.:

(Signature of Notary Public - State of Florida)
 Print, Type or Stamp Commissioned Name
 of Notary Public:

Personally Known _____ or Produced Identification _____
 Type of Identification Produced: _____

VERIFICATION, RECOMMENDATION, CONCURRENCES AND APPROVALS

(Signatures)

(Date)

Quantities verified by: _____

Consultant / Engineer: _____

Project Manager: _____

Department Head: _____

Payment Approved by the
 Board of County Commissioners: _____

Attested to by the Clerk of Circuit Court: _____

PAGE _____ OF _____

PAY APPLICATION SCHEDULE OF STORED MATERIALS

MANATEE COUNTY
PROJECT MANAGEMENT
A COMMITMENT TO EXCELLENCE

NOTE: CONTESTANTS MAY USE A COMPUTER SPREADSHEET IN LIEU OF FILING IN THIS FORM. IF SAME INFORMATION IS PROVIDED
00550-3

MARCH 19, 2000

		Change Order No.:	
		Contract Amount: (Present Value)	
PROJECT:		Project Number:	
NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
	SAMPLE SHEET ONLY OBTAIN CURRENT VERSION OF FORM FROM PROJECT MANAGER		
		TOTAL DECREASE:	TOTAL INCREASE:
Contractor: Address: City / State: Contractor Signature:		THE NET CHANGE ADJUSTS THE CURRENT CONTRACT AMOUNT FROM TO ____ CALENDAR DAYS ARE ADDED TO THE SCHEDULE WHICH CHANGES FINAL COMPLETION TO _____	
RECOMMENDATION, CONCURRENCES AND APPROVALS			
SIGNATURES		DATE	
Consultant (as applicable): _____			
Project Engineer: _____			
Project Manager: _____			
Department Head: _____			
Approved by the Manatee County Board of County Commissioners: _____			
Chairman: _____			
Clerk of the Circuit Court: _____			

CONTRACT CHANGE ORDER		Change Order No:	
Page 2 (Continuation)		Project Number:	
NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
	SAMPLE SHEET ONLY OBTAIN CURRENT VERSION OF FORM FROM PROJECT MANAGER		
		DECREASE SUBTOTAL:	INCREASE SUBTOTAL:

CONTRACT CHANGE ORDER

Change Order No.:

Page 3 (Continuation)

Project Number:

NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
	SAMPLE SHEET ONLY OBTAIN CURRENT VERSION OF FORM FROM PROJECT MANAGER		
		DECREASE SUBTOTAL:	INCREASE SUBTOTAL:

JUSTIFICATION FOR CHANGE		Change Order No : Project Number:
<p>1. NECESSITY FOR CHANGE:</p> <p>SAMPLE SHEET ONLY OBTAIN CURRENT VERSION OF FORM FROM PROJECT MANAGER</p> <p>2. Is change an alternate bid? (yes / no)</p> <p>3. Does change substantially alter the physical size of the project? (yes / no) (If yes, explain)</p> <p>4. Effect of this change on other "Prime" contractors?</p> <p>5. Has the Surety and insurance company been notified, if applicable?</p>		

DISCRETIONARY WORK - FIELD DIRECTIVE		FIELD DIRECTIVE NO:
PROJECT:		PROJECT NO.:
ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE
	SAMPLE SHEET ONLY OBTAIN CURRENT VERSION OF FORM FROM PROJECT MANAGER	
		DECREASE
CONTRACTOR: ADDRESS: CITY/STATE: CONTRACTOR SIGNATURE:		THE DISCRETIONARY WORK AMOUNT IS DECREASED \$ FROM \$ TO \$ WITH NO CHANGE TO THE TOTAL CONTRACT AMOUNT. TIME CAN ONLY BE ADDED BY CHANGE ORDER
RECOMMENDATION, CONCURRENCES AND APPROVALS		
SIGNATURES		DATE
CONSULTANT:		
PROJECT ENGINEER:		
PROJECT MANAGER:		
SENIOR PROJECT MANAGER:		

CERTIFICATE OF SUBSTANTIAL COMPLETION (S.C.)		CHECK ONE:	
		Partial:	Total:
Project Title:	Date Submitted:		
Contractor Data: Name: Address: City/State/zip:	Project No.: S.C. Date (Proposed)		

If the "Partial" completion box above is checked, the following description applies to the work for which substantial completion is being sought. Otherwise, the work described in the Contract including approved changes, if any, is certified to be substantially complete:
(Description of the portion of work substantially completed):

SAMPLE SHEET ONLY
OBTAIN CURRENT VERSION OF FORM
FROM PROJECT MANAGER

(USE CONTINUATION SHEETS IF NECESSARY)

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item does not alter the Contractor's responsibility to complete all of the contract work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by the Contractor within _____ days of substantial completion. The approved substantial completion date is: _____.

Contractor Signature

/ Date

Engineer's Approval

/ Date

Printed Name and Title

Printed Name and Title

The Contractor shall be responsible for security, operation, safety, maintenance, HVAC, insurance and warranties in accordance with the Contract. The County will assume the responsibility for paying the cost of electrical power from midnight of the date of Engineer's approval as indicated above.

ATTACH THE INSPECTOR'S FINAL WALKTHROUGH LIST OF DEFICIENCIES.

**FINAL RECONCILIATION, WARRANTY PERIOD DECLARATION
AND CONTRACTOR'S AFFIDAVIT**

Project Title:	Date Submitted:
Contractor Data:	Project No.:
Name: SAMPLE SHEET ONLY Address: OBTAIN CURRENT VERSION OF FORM City/State/zip: FROM PROJECT MANAGER	Warranty (months):

This Final Reconciliation is for the work performed for Manatee County by the above named Contractor, hereinafter called CONTRACTOR, pursuant to a contract dated _____, as amended, and acts as an addendum thereto.

It is agreed that all quantities and prices in the attached Final Pay Estimate No. _____ are correct, that the amount of \$ _____, including retainage, is due to the CONTRACTOR, that no claims are outstanding as between the parties, and that the above stated sum represents the entirety of monies owed the CONTRACTOR.

It is further agreed that the warranty period for CONTRACTOR'S work pursuant to the Contract is from _____ to _____.

As (title) _____ for CONTRACTOR, I have authority to bind said CONTRACTOR, and as such make this final reconciliation, declaration and affidavit for the purpose of inducing Manatee County to make final payment to CONTRACTOR for work done at / upon _____ under said contract:

CONTRACTOR has paid all social security and withholding taxes accrued in connection with this construction project.

CONTRACTOR has paid all workers' compensation and other insurance premiums incurred in connection with this construction project.

CONTRACTOR has paid for all required permits in connection with this construction project.

All laborers, materialmen, suppliers, subcontractors and service professionals who worked for and/or supplied materials, equipment and/or services to the CONTRACTOR under this construction contract have been paid in full.

_____ (Affiant Signature)

NOTARY:

State of Florida County of _____, Sworn to (or affirmed) and subscribed before me this _____ day of _____, _____, by _____ (person giving notice).

Signature of Notary Public - State of Florida: _____
Print, Type or Stamp Commissioned Name of Notary Public:

Personally known _____ or produced identification _____
Type of Identification Produced:

ADMINISTRATIVE CONTRACT ADJUSTMENT

PROJECT:

Contract Adj. No.:

Contract Amount:
(Present Value)

Project Number:

NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
	BY EXECUTION OF THIS CHANGE ORDER THE CONTRACTOR AGREES THAT ALL CLAIMS FOR ADDITIONAL CONTRACT TIME AND FEES FOR THE ITEMS IN THIS CHANGE ORDER HAVE BEEN SATISFIED.		
		TOTAL DECREASE:	TOTAL INCREASE:
Contractor: Address: City / State: Contractor Signature: _____ Date _____		THE NET CHANGE OF ADJUSTS THE CURRENT CONTRACT AMOUNT FROM TO	
RECOMMENDATION, CONCURRENCES AND APPROVALS			
		SIGNATURES	DATE
Consultant / Engineer		_____	_____
Project Manager:		_____	_____
Division Manager:		_____	_____
Department Director/ Deputy Director:		_____	_____

ADMINISTRATIVE CONTRACT ADJUSTMENT Page 2 (Continuation)		Contract Adj. No.:	
		Project Number:	
NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
		DECREASE SUBTOTAL:	INCREASE SUBTOTAL:

SECTION 00700
GENERAL CONDITIONS

ARTICLE I - DEFINITIONS

Whenever used in the Bid Documents, the following terms have the meaning indicated which are applicable to both the singular and plural thereof:

Addendum - Written or graphic instruments issued prior to the opening of bids which clarify or change the bidding documents or the contract documents.

Agreement - The written Agreement between Owner and Contractor covering the Work to be performed; other contract documents are attached to the Agreement and made a part thereof as provided therein.

Written Amendment - A written amendment of the contract documents, signed by Owner and Contractor on or after the effective date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly work related aspects of the contract documents.

Application for Payment - The form accepted by Project Representative which is to be used by Contractor in requesting progress or final payments and which is to include such supporting documentation as is required by the contract documents.

Award - Acceptance of the bid from the person, firm, or corporation which in the Owner's sole and absolute judgment will under all circumstances best serve the public interest. Award shall be made by a majority vote of a quorum of Manatee County Board of County Commissioners in open session; or by the Purchasing Director in accordance with Ordinance 84-02, Manatee County Procurement Code.

Bid - The offer of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - One who submits a bid directly to the Owner, as distinct from a sub-bidder, who submits a bid to a Bidder.

Bidding Documents - Consists of the Invitation For Bid, which includes but is not limited to: the bid form, drawings, technical specifications, terms and conditions, and the proposed contract documents (including all Addenda issued prior to receipt of bids); and becomes a part of the Agreement.

Bonds - Performance and payment bonds and other instruments of security.

Change Order - A document recommended by Project Representative which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work, or an adjustment in the contract price or the contract time, issued on or after the effective date of the Agreement.

Compensable Delay - Any delay beyond the control and without the fault or negligence of the Contractor resulting from Owner-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by Owner.

Contract Documents - The Agreement, Addenda (which pertain to the contract documents), Contractor's bid (including documentation accompanying the bid and any post-bid documentation submitted prior to the Notice of Award), the bonds, the specifications and the drawings, together with all amendments, modifications and supplements issued on or after the effective date of the Agreement.

Contract Price - The monies payable by Owner to Contractor under the contract documents as stated in the Agreement.

Contract Time - The number of days or the date stated in the Notice to Proceed for the completion of the Work.

Contractor - The person, firm or corporation with whom Owner has entered into an Agreement.

Days - All references to days are to be considered calendar days except as specified differently.

Defective - An adjective which when modifying the 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, reference standard, test or approval referred to in the contract documents, or has been damaged prior to Project Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner).

Drawings - The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by Engineer and are referred to in the bidding and contract documents.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective (date of execution).

Excusable Delay - Any delay beyond the control and without the negligence of the Contractor, the Owner, or any other contractor caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, fires, floods, freight embargoes, acts of government other than Owner, or epidemics. Labor disputes and above average rainfall shall give rise only to excusable delays.

Float or Slack Time - The time available in the progress schedule during which an unexpected activity can be completed without delaying substantial completion of the Work.

Field Order - A written order issued by Project Representative which orders minor changes in the Work, but which does not involve a change in the contract price or the contract time.

Inexcusable Delay - Any delay caused by events or circumstances within the control of the Contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the Contractor.

Non-prejudicial Delay - Any delay impacting a portion of the Work within the available total float or slack time and not necessarily preventing completion of the Work within the contract time.

Notice of Award - The written notice to the successful bidder stating Award has been approved by the Board of County Commissioners; or by the Purchasing Director in accordance with Ordinance 08-43, Manatee County Purchasing Code.

Notice of Intent to Award - The written notice to the apparent low bidder stating Award has been recommended with final Award to be authorized by Ordinance 08-43, Manatee County Purchasing Code.

Notice to Proceed - Written notice by Owner (after execution of contract) to Contractor fixing the date on which the contract time will commence to run and on which Contractor shall start to perform (ten (10) days from date of such notice) Contractor's obligations under the contract documents.

Owner - Manatee County, Florida, Board of County Commissioners.

Preconstruction Conference - Prior to starting the Work, a meeting scheduled by Owner with Contractor to review the Work schedules, to establish procedures for handling shop drawings and other submissions, for processing periodical pay estimates, and such other matters as may be pertinent to the project.

Prejudicial Delay - Any excusable or compensable delay impacting the Work and exceeding the total float available in the progress schedule, thus preventing completion of the Work within the contract time unless the Work is accelerated.

Pre-operation Testing - All field inspections, installation checks, water tests, performance tests and necessary corrections required of Contractor to demonstrate that individual components of the work have been properly constructed and do operate in accordance with the contract documents for their intended purposes.

Project - The total construction of which the Work to be provided under the contract documents may be the whole or a part as indicated elsewhere in the contract documents.

Project Representative - The authorized representative of Owner who is assigned to the project or any part thereof.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a supplier and submitted by Contractor to illustrate material or equipment for some portion of the Work.

Specifications - Those portions of the contract documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor - An individual or corporation having a direct contact with Contractor or with any other subcontractor for the performance of a part of the Work at the site. Such person or firm has contractual relations with the Contractor, not with the Owner.

Substantial Completion - The Work (or a specified part thereof) has progressed to the point when, in the opinion of the Engineer as evidenced by Engineer's definitive certificate of Substantial Completion, it is sufficiently complete in accordance with contract documents so that the work can be utilized for the purposes for which it is intended; or if there be no such certificate issued, when final payment is due.

Successful Bidder - The lowest qualified, responsible and responsive bidder to whom an award is made.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman or vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments and any encasement containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work - Work to be paid for on the basis of unit prices.

Work - The entire completed construction 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 materials and equipment into the construction, all as required by the contract documents.

Work Directive Change - A written directive to contractor, issued on or after the effective date of the Agreement and signed by Owner and recommended by Project Representative ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or to emergencies. A work directive change may not change the contract price or the contract time; but is evidence that the parties expect that the change directed or documented by a work directive change will be incorporated in a subsequently issued change order following negotiations by the parties as to its effect, if any, on the contract price or contract time.

ARTICLE 2 - PRELIMINARY MATTERS

Computation of Time: When time is referred to in the contract documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or legal holiday, such day will be omitted from the computation.

- 2.1 The Contractor must submit a proposed schedule of the Work at the preconstruction conference. The purpose of this schedule is to enable the Owner to govern the Work, to protect the functions of the local government and its citizens and to aid in providing appropriate surveillance. The Owner shall have the right to reschedule work provided such rescheduling is in accord with the remainder of terms of the contract. The schedule shall show, as a minimum, the approximate dates on which each segment of the work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The Owner, after necessary rescheduling and obtaining additional information for specific purposes, shall review and approve the schedule. The Contractor shall also forward to the Owner, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the work under the contract, in fabrication and in the field, stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, the Contractor shall submit any necessary revisions to the original schedule for the Owner's review and approval. In addition, more detailed schedules may be required by the Owner for daily traffic control.
- 2.2 A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. The contract time will commence at the time specified in such notice. Contractor shall start to perform the Work on the date specified in the notice to proceed, but no work shall be done at the site prior to the date on which the contract time commences to run.
- 2.3 If at any time the materials and appliances to be used appear to the Owner as insufficient or improper for securing the quality of work required or the required rate of progress, the Owner may order the Contractor to increase his efficiency or to improve the character of his work and the Contractor shall conform to such an order. The failure of the Owner to demand any increase of such efficiency of any improvement shall not release the Contractor from his obligation to secure the quality of work or the rate of progress necessary to complete the Work within the limits imposed by the contract. The Owner may require the Contractor to remove from the Work such employees as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Work is deemed to be contrary to the Owner's interest.
- 2.4 The Owner reserves the right to let other Contracts in connection with this Work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and execution of their Work, and promptly connect and coordinate the Work with theirs.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, RE-USE

- 3.1 The contract documents comprise the entire Agreement between Owner and Contractor concerning the work. The contract documents are complementary; what is called for by one is as binding as if called for by all. The contract documents will be construed in accordance with the laws and ordinances of the state of Florida and Manatee County.

Should a conflict exist within the Contract Documents, the precedence in ascending order of authority is as follows: 1) Standard Printed Technical Specifications, 2) Special Conditions, 3) General Conditions and 4) Drawings. Note: Computed dimensions shall govern over scaled dimensions.

- 3.2 It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the contract documents. Any work, materials or equipment that may reasonably be inferred from the contract documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of bids, 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 be effective to change the duties and responsibilities of Owner, Contractor or Engineer, or any of their agents or employees from those set forth in the Contract Documents.
- 3.3 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
 - 3.3.1 A Formal Written Amendment
 - 3.3.2 A Change Order
 - 3.3.3 A Work Directive Change
 - 3.3.4 An Administrative Contract Adjustment
- 3.4 In addition, the requirements of the contract documents may be supplemented and minor variations and deviations in the Work may be authorized in one or more of the following ways:
 - 3.4.1 A Field Order
 - 3.4.2 Engineer's approval of a Shop Drawing or sample.

ARTICLE 4 - CONTRACTOR'S RESPONSIBILITIES

- 4.1 Contractor shall keep on the Work at all times during its progress a competent resident superintendent; who shall be the Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications given to the superintendent shall be as binding as if given to Contractor.

4.2 Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the contract documents. Contractor shall at all times maintain good discipline and order at the site. 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 contract documents, all Work at the site shall be performed during regular working hours and Contractor will not permit overtime work or the performance of work on Sunday or legal holiday without Owner's written consent given after prior notice to Engineer (at least 72 hours in advance).

4.2.1 Contractor shall pay for all additional engineering charges to the Owner for any overtime work which may be authorized. Such additional engineering charges shall be a subsidiary obligation of Contractor and no extra payment shall be made by Owner on account of such overtime work. At Owner's option, overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment.

4.3 Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

4.4 All materials and equipment shall be of good quality and new, except as otherwise provided in the contract documents. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable supplier except as otherwise provided in the contract documents.

4.5 Contractor shall be fully responsible to Owner for all acts and omissions of the subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between Owner or Engineer and any such subcontractor, supplier or other person or organization, nor shall it create any obligation on the part of Owner to pay or to see to the payment of any monies due any such subcontractor, supplier or other person or organization.

4.6 Permits: Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

4.7 During the progress of the Work, Contractor shall keep the premises free from accumulation of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, 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 Owner. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents.

4.8 Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

4.9 Safety and Protection: Contractor shall comply with the Florida Department of Commerce Safety Regulations and any local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

- 4.9.1 all employees on the Work and other persons and organizations who may be affected thereby;
- 4.9.2 all the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and
- 4.9.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

Contractor shall comply with all applicable laws and regulations 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. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic way for the public and preservation of the Owner's business, taking into full consideration all local conditions. Contractor's duties and responsibilities for the safety and protection of the work shall continue until such time as all the work is completed.

4.10 Emergencies: In emergencies affecting the safety or protection of persons or the work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Engineer or Owner, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the work or variations from the contract documents have been caused thereby. If Owner determines that a change in the contract documents is required because of the action taken in response to an emergency, a Work Directive Change or Change order will be issued to document the consequences of the changes or variation.

4.11 For substitutes not included with the bid, but submitted after the effective date of the Agreement, Contractor shall make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provisions of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by the Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed substitute. In rendering a decision, Owner/Engineer and Contractor shall have access to any available float time in the construction schedule. In the event that substitute materials or equipment not included as part of the bid, but proposed after the effective date of the agreement, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate change order executed.

4.11.1 If a specific means, method, technique, sequence of procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Engineer if Contractor submits sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents.

4.11.2 Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a change order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

4.11.3 Contractor shall reimburse Owner for the charges of Engineer and Engineer's Consultants for evaluating each proposed substitute submitted after the effective date of the Agreement and all costs resulting from any delays in the work while the substitute was undergoing review.

4.12 The Contractor shall furnish, free of charge, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the Work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the project or parts of the project critical are involved, the Contractor will employ a competent surveyor who is registered in the state of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the work. The Contractor will be held responsible for the preservation of all stakes, marks and if for any reason any of the

stakes or marks or batter boards become destroyed or disturbed, they will be immediately and accurately replaced by the Contractor.

- 4.13 The Contractor has, by careful examination, satisfied himself as to the nature and location of the Work and all other matters which can in any way affect the Work under this contract, including, but not limited to details pertaining to boring, as shown on the drawings, are not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the site of the work, approximately at the locations indicated. The Contractor shall examine boring data, where available, and make his own interpretation of the subsoil investigations and other preliminary data, and shall base his bid on his own opinion of the conditions likely to be encountered. In no event shall an extension of time be considered for any conditions that existed at the time of bidding, nor shall the Contractor receive extra compensation for completion of the project as intended by the drawings and in keeping with the Contract Documents. No verbal agreement or conversation with any officer, agent or employee of the Owner, before or after the execution of this contract, shall affect or modify any of the terms or obligations herein contained.
- 4.14 If the Contractor, in the course of the Work, finds that the drawings and/or technical specifications cannot be followed, he shall immediately inform the Owner in writing, and the Owner shall promptly check the accuracy of the information. Any work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's risk.

ARTICLE 5 - OWNER'S RESPONSIBILITIES

- 5.1 Owner shall furnish the data required of Owner under the Contract Documents promptly and shall make payments to the Contractor within a reasonable time (no more than 20 days) after the Work has been accepted by the County. The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the contract documents shall be determined by the Owner/Engineer. Standard County forms shall be utilized.
- 5.2 The Owner shall provide the lands upon which the Work under this contract is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same.
- 5.3 The Owner shall have the right to take possession of and use any completed portions of the work, although the time for completing the entire work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents.

ARTICLE 6 - CHANGES IN THE WORK

- 6.1 Without invalidating the Agreement and without notice to any surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a change order, or a work directive change. Upon receipt of any

such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the contract documents (except as otherwise specifically provided).

- 6.2 Contractor shall not be entitled to an increase in the contract price or an extension of the contract time with respect to any Work performed that is not required by the contract documents as amended, modified and supplemented.
- 6.3 Owner and Contractor shall execute appropriate change orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work.
- 6.4 At any time Engineer may request a quotation from Contractor for a proposed change in the Work and within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the contract price or contract time for the proposed change. Engineer shall have 21 calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the request for quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

ARTICLE 7 - CHANGE OF CONTRACT PRICE

- 7.1 The contract price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at his expense without change in the contract price.
- 7.2 The contract price may only be changed by change order or by a written amendment. Any claim for an increase or decrease in the contract price shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within ten (10) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event.
- 7.3 The value of any Work covered by a change order or of any claim for an increase or decrease in the contract price shall be determined in one of the following ways (at Owner's discretion):

- 7.3.1 Where the Work involved is covered by unit prices contained in the contract documents, cost will be determined by application of such unit prices to the quantities of the items involved.
- 7.3.2 By mutual acceptance of lump sum.
- 7.3.3 On the basis of the cost of the Work, plus a 20% Contractor's fee for overhead and profit. (Contractor shall submit an itemized cost breakdown together with supporting data.)

7.4 Either Owner or Contractor may make a claim for an adjustment in the contract price. The unit price of an item of unit price Work shall be subject to re-evaluation and adjustment under the following conditions:

- 7.4.1 If the total cost of a particular item of unit price Work amounts to 5% or more of the contract price and the variation in the quantity of the particular item of unit price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and
- 7.4.2 If there is no corresponding adjustment with respect to any other item of Work; and
- 7.4.3 If a Contractor believes that it has incurred additional expense as a result thereof; or
- 7.4.4 If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or
- 7.4.5 If the parties are unable to agree as to the effect of any such variations in the quantity of unit price Work performed.

ARTICLE 8 - CHANGE OF CONTRACT TIME

- 8.1 Contract time may only be changed by a change order or a written amendment. Any claim for an extension or shortening of the contract time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event.
- 8.2 The contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional work; or to fires, floods, epidemics, abnormal weather conditions or acts of God.
- 8.3 All time limits stated in the contract documents are of the essence.

ARTICLE 9 - WARRANTY, TEST/INSPECTION, CORRECTION

- 9.1 Contractor warrants (for a minimum period of three years or as otherwise stated herein) and guarantees to Owner that all work will be in accordance with the contract documents and will not be defective; that Owner, representatives of Owner, governmental agencies with jurisdictional interests will have access to the work at reasonable time for their observation, inspecting and testing (Contractor shall give Engineer timely notice of readiness of the work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by Owner).
- 9.2 If any work (including work of others) that is to be inspected, tested, or approved is covered without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice. Neither observations by Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the work in accordance with the Contract Documents.
- 9.3 If the work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the work in such a way that the completed work will conform to the contract documents, Owner may order Contractor to stop the work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated. Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective work, including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and any additional expenses experienced by Owner due to delays to other Contractors performing additional work and an appropriate deductive change order shall be issued. Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to an extension of the contract time and the recovery of delay damages due to correcting or removing defective work.
 - 9.3.1 If Contractor fails within seven (7) days after written notice to correct defective work, or fails to perform the work in accordance with the contract documents, or fails to comply with any other provision of the contract documents, Owner may correct and remedy any such deficiency. To the extent necessary to complete corrective and remedial action, Owner may exclude Contractor from all or part of the site, take possession of all or part of the work, Contractor's tools, construction equipment and machinery at the site or for which Owner has paid Contractor but which are stored elsewhere. All direct, indirect and consequential costs of Owner in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Engineer and a change order will be issued incorporating the necessary revisions.

9.3.2 If within three years after the date of completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the contract documents, any work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, either correct such defective work or if it has been rejected by Owner, remove it from the site and replace it with non-defective work. If Contractor does not promptly comply with the terms of such instruction, Owner may have the defective work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor.

ARTICLE 10 - SUSPENSION/TERMINATION OF WORK

10.1 Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor, which will fix the date on which work will be resumed. Contractor shall be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any suspension if Contractor makes an approved claim therefore.

10.2 Owner may terminate the contract if Contractor commences a voluntary case under any chapter of the Bankruptcy Code or any similar action by filing a petition under any other federal or state law relating to the bankruptcy or insolvency; if a petition is filed against the Contractor under any chapter of the Bankruptcy Code or similar relief under any other federal or state law; if Contractor persistently fails to perform the work in accordance with the contract documents; if Contractor disregards laws or regulations of any public body having jurisdiction or the Engineer; or otherwise violates in any substantial way any provisions of the contract.

10.2.1 Owner may, after giving Contractor (and the surety, if there is one) seven (7) days written notice and to the extent permitted by laws and regulations, terminate the services of Contractor; exclude Contractor from the site and take possession of the work and of all Contractor's tools, construction equipment and machinery at the site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the work all materials and equipment stored at the site or for which owner has paid Contractor but which are stored elsewhere, and finish the work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the work, but delivered and suitably stored, less the aggregate of payments previously made. If the direct and indirect costs of completing the work exceed the unpaid balance of the contract price, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner and incorporated in a change order; but in finishing the work, Owner shall not be required to obtain the lowest figure for the work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement.

10.3 If, through no act or fault of Contractor, the work is suspended for a period of more than ninety (90) days by Owner or under an order of court or other public authority, or Engineer fails to act on any application or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon seven (7) days written notice to Owner terminate the Agreement and recover from Owner payment for all work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Engineer has failed to act on any application of payment or Owner has failed to make any payment as aforesaid, Contractor may upon seven (7) days written notice to Owner stop the work until payment of all amounts then due.

ARTICLE 11 - CONTRACT CLAIMS

11.1 The rendering of a decision by Engineer with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercised by Owner or Contractor of such right or remedies as either may otherwise have under the contract documents or by laws or regulations in respect of any such claim, dispute or other matter. No action, either at law or at equity, shall be brought in connection with any such claim, dispute or other matter later than thirty (30) days after the date on which Owner/Engineer has rendered such written decision in respect thereof. Failure to bring an action within said thirty (30) day period shall result in Engineer's decision being final and binding on the Contractor. In no event may any such action be brought after the time at which instituting such proceedings would be otherwise barred by the applicable statute of limitations.

11.2 Before bringing any action in court pertaining to any claim, dispute or other matter in question(s) arising out of or relating to the contract documents or the breach thereof, or Engineer's final decision, except for claims which have been waived by the making and acceptance of final payment, the Contractor shall first submit written notice(s) of contract claims to the Purchasing Director for a decision; the Contractor may request a conference with the Purchasing Director. Claims include, without limitation, disputes arising under the contract and those based upon breach of contract, mistake, misrepresentation, or other cause for contract modification or revision. The Purchasing Director is authorized to resolve any claim prior to the filing of a request for a hearing with the Board of County Commissioners or the commencement of an action in a court of competent jurisdiction; but may not settle any such claim for consideration of \$10,000 or more in value without the prior approval of the Board of County Commissioners.

The decision of the Purchasing Director shall be promptly issued in writing to the Contractor. If an adverse decision has been rendered, the notice of decision shall inform the Contractor of his right to request a hearing with the Board of County Commissioners.

11.2.1 The Purchasing Director's decision shall be final and conclusive unless, within ten (10) calendar days from the date of receipt of the decision, the Contractor files a written request for hearing with the Board of County Commissioners.

11.2.2 If the Purchasing Director does not issue a written decision regarding any contract controversy within fourteen (14) days after receipt of a written request for a final decision, or within such longer period as may be agreed upon between the parties, then the aggrieved party may proceed as if an adverse decision had been issued.

ARTICLE 12 - RESIDENT PROJECT REPRESENTATIVE - DUTIES, RESPONSIBILITIES

12.1 Resident Project Representative is Engineer/Owner's Agent, who will act as directed by and under the supervision of the Engineer, and who will confer with Owner/Engineer regarding his actions. Resident Project Representative's dealing in matters pertaining to the on-site work shall, in general, be only with the Owner/Engineer and Contractor and dealings with subcontractors shall only be through or with the full knowledge of Contractor.

12.2 Resident Project Representative will:

- 12.2.1 Review the progress schedule, schedule of shop drawing submissions and schedule of values prepared by Contractor and consult with Owner/Engineer concerning their acceptability.
- 12.2.2 Attend preconstruction conferences. Arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Engineer and notify those expected to attend in advance. Attend meetings and maintain and circulate copies of minutes thereof.
- 12.2.3 Serve as Owner/Engineer's liaison with Contractor, working principally through Contractor's superintendent and assist him in understanding the intent of the contract documents. As requested by Owner/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work.
- 12.2.4 Receive and record date of receipt of shop drawings and samples, receive samples which are furnished at the site by Contractor and notify Owner/Engineer of their availability for examination.
- 12.2.5 Advise Owner/Engineer and Contractor or his superintendent immediately of the commencement of any work requiring a shop drawing or sample submission if the submission has not been approved by the Owner/Engineer.
- 12.2.6 Conduct on-site observations of the work in progress to assist Owner/Engineer in determining if the work is proceeding in accordance with the contract documents and that completed work will conform to the contract documents.

- 12.2.7 Report to Owner/Engineer whenever he believes that any work is unsatisfactory, faulty or defective or does not conform to the contract documents, or does not meet the requirements of any inspections, tests or approvals required or if work has been damaged prior to final payment; and advise Owner/Engineer when he believes work should be corrected or rejected or should be uncovered for observation or requires special testing, inspection or approval.
- 12.2.8 Verify that tests, equipment and system start-ups and operating and maintenance instructions are conducted as required by the contract documents and in the presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures and start-ups.
- 12.2.9 Accompany visiting inspectors representing public or other agencies having jurisdiction over the project, record the outcome of these inspections and report to Owner/Engineer.
- 12.2.10 Transmit to Contractor, Owner/Engineer's clarifications and interpretations of the contract documents.
- 12.2.11 Consider and evaluate Contractor's suggestions or modifications in drawings or technical specifications and report them with recommendations to Owner/Engineer.
- 12.2.12 Maintain at the job site orderly files for correspondence, reports of job conferences, shop drawings and sample submissions, reproductions of original contract documents including all addenda, change orders, field orders, additional drawings issued subsequent to the execution of the contract, Owner/Engineer's clarifications and interpretations of the contract documents, progress reports and other project related documents.
- 12.2.13 Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to Owner/Engineer.
- 12.2.14 Record names, addresses and telephone numbers of all Contractors, subcontractors and major suppliers of materials and equipment.
- 12.2.15 Furnish Owner/Engineer periodic reports as required of progress of the work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions.
- 12.2.16 Consult with Owner/Engineer in advance of scheduling major tests, inspections or start of important phases of the work.

- 12.2.17 Report immediately the occurrence of any accident.
- 12.2.18 Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Engineer, noting particularly their relation to the schedule of values, work completed and materials and equipment delivered at the site but not incorporated in the work.
- 12.2.19 During the course of the work, verify that certificates, maintenance and operations manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed, and deliver this material to Owner/Engineer for his review prior to final acceptance of the work.
- 12.2.20 Before Owner/Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.
- 12.2.21 Conduct final inspection in the company of Owner/Engineer and Contractor and prepare a final list of items to be completed or corrected.
- 12.2.22 Verify that all items on final list have been completed or corrected and make recommendations to Owner/Engineer concerning acceptance.

12.3 Except upon written instructions of Owner/Engineer, Resident Project Representative:

- 12.3.1 Shall not authorize any deviation from the contract documents or approve any substitute materials or equipment;
- 12.3.2 Shall not exceed limitations on Owner/Engineer's authority as set forth in the contract documents;
- 12.3.3 Shall not undertake any of the responsibilities of Contractor, Subcontractors or Contractor's Superintendent, or expedite the work;
- 12.3.4 Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the contract documents;
- 12.3.5 Shall not advise on or issue directions as to safety precautions and programs in connection with the work;
- 12.3.6 Shall not authorize Owner to occupy the project in whole or in part; and
- 12.3.7 Shall not participate in specialized field or laboratory tests.

ARTICLE 13 - APPRENTICES

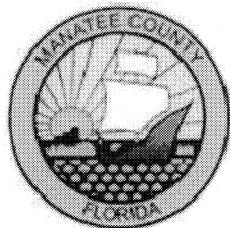
- 13.1 In accordance with the requirement of Section 446.011, Florida Statutes, the following requirements to safeguard the welfare of apprentices and trainees shall be a part of this contract, if applicable.
 - 13.1.1 Contractor agrees to hire for the performance of the contract, a number of apprentices or trainees in each occupation which bears to the average number of the journeymen in that occupation to be employed in the performance of the contract, the ratio of at least one apprentice or trainee to every five journeymen.
 - 13.1.2 Contractor agrees, when feasible to assure that 25% of such apprentices or trainees are in their first year of training, except when the number of apprentices or trainees to be hired is fewer than four.
 - 13.1.3 Contractor agrees to submit, at three month intervals, to the Bureau of Apprenticeship of the Division of Labor, records of employment by trade of the number of apprentices or trainees employed; race of all apprentices; the number of apprentices or trainees in their first year of training; and total hours of work of all apprentices, trainees, and journeymen.
 - 13.1.4 Contractor agrees to submit to the Bureau of Apprenticeship of the Division of Labor, at three month intervals, a statement describing steps taken toward making a diligent effort in the hiring of apprentices and trainees and containing a breakdown by craft of hours worked and wages paid for first year apprentices or trainees, other apprentices or trainees and journeymen.

NOTE: The form of all submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract shall be determined by the County.

END OF SECTION

DIVISION 00

BIDDING/CONTRACT REQUIREMENTS



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PROJECT MGMT

MANATEE COUNTY

SWRWTP

ADMINISTRATION BUILDING RENOVATIONS

PROJECT MANUAL

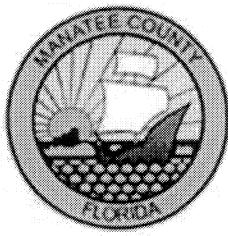
(Containing Bidding Instructions, Bid Forms, Contract Requirements and Technical Specifications)

ISSUED FOR BIDDING

Prepared By:

URS

December 8, 2008



Manatee County SWRWTP

Administration Building Renovations

Manatee County, Florida

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
<u>BIDDING AND CONTRACT REQUIREMENTS</u>		
00300	BID FORM	1 - 2
<i>Remainder of Conditions/Sections/Forms Provided by Owner</i>		
<u>DIVISION 1 - GENERAL REQUIREMENTS</u>		
01005	GENERAL REQUIREMENTS	1 - 14
01010	SUMMARY OF WORK	1 - 2
01015	CONTROL OF WORK	1 - 5
01020	OWNER'S ALLOWANCES	1 - 2
01030	SPECIAL PROJECT PROCEDURES	1 - 4
01045	CUTTING AND PATCHING	1 - 2
01050	FIELD ENGINEERING AND SURVEYING	1 - 2
01090	REFERENCE STANDARDS	1 - 3
01150	MEASUREMENT AND PAYMENT	1 - 6
01152	REQUESTS FOR PAYMENT	1
01153	CHANGE ORDER PROCEDURES	1 - 4
01200	PROJECT MEETINGS	1 - 2
01310	CONSTRUCTION SCHEDULE & PROJECT RESTRAINTS	1 - 6

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
<u>DIVISION 1 - GENERAL REQUIREMENTS</u>		
01340	SHOP DRAWINGS, PRODUCT DATA AND SAMPLES	1 - 6
01370	SCHEDULE OF VALUES	1 - 2
01380	CONSTRUCTION PHOTOGRAPHS	1 - 2
01410	TESTING AND TESTING LABORATORY SERVICES	1 - 2
01510	TEMPORARY AND PERMANENT UTILITIES	1 - 2
01570	TRAFFIC REGULATIONS	1 - 2
01580	PROJECT IDENTIFICATION AND SIGNS	1 - 2
01590	ENGINEER'S FIELD OFFICE	1 - 3
01600	MATERIALS AND EQUIPMENT	1 - 3
01620	STORAGE AND PROTECTION	1 - 3
01700	CONTRACT CLOSEOUT	1 - 3
01710	CLEANING	1 - 2
01720	PROJECT RECORD DOCUMENTS	1 - 5
01730	OPERATING AND MAINTENANCE DATA	1 - 5
01740	WARRANTIES AND BONDS	1 - 2
*	Report entitled "Limited NESHAP Asbestos Demolition Renovation Survey, Utility Operations Department (Laboratory Area), Bradenton, Manatee County, Florida", dated April 9, 2003, prepared by Professional Service Industries, Inc., Tampa, Florida is attached to the end of this Division.	
<u>DIVISION 2 - SITE WORK</u>		
02060	MINOR DEMOLITION FOR REMODELING	1 - 4
02820	ASBESTOS ABATEMENT	1 - 10
<u>DIVISION 3 - CONCRETE</u>		
"Not Used"		
<u>DIVISION 4 - MASONRY</u>		
"Not Used"		
<u>DIVISION 5 - METALS</u>		
05400	COLD-FORMED METAL FRAMING	1 - 5
<u>DIVISION 6 - WOOD AND PLASTICS</u>		
06100	ROUGH CARPENTRY	1 - 6
06402	INTERIOR ARCHITECTURAL WOODWORK	1 - 11

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
<u>DIVISION 7 - THERMAL AND MOISTURE PROTECTION</u>		
07210	BUILDING INSULATION	1 - 2
07270	FIRESTOPPING	1 - 6
07920	JOINT SEALANTS	1 - 6
<u>DIVISION 8 - DOORS AND WINDOWS</u>		
08125	INTERIOR ALUMINUM DOORS FRAMES	1 - 3
08211	FLUSH WOOD DOORS	1 - 6
08710	FINISH HARDWARE	1 - 9
08800	GLASS AND GLAZING	1 - 7
<u>DIVISION 9 - FINISHES</u>		
09001	FINISH AND MATERIAL SCHEDULE	1 - 3
09250	GYPSUM WALLBOARD	1 - 5
09255	VENEER PLASTER	1 - 3
09300	TILE WORK	1 - 7
09510	ACOUSTICAL CEILINGS	1 - 4
09650	RESILIENT BASE	1 - 4
09652	SHEET VINYL FLOOR COVERINGS	1 - 6
09900	PAINTING	1 - 6
<u>DIVISION 10 - SPECIALTIES</u>		
10100	VISUAL DISPLAY BOARDS	1 - 5
10160	TOILET COMPARTMENTS	1 - 4
10425	SIGNAGE	1 - 4
10505	METAL LOCKERS	1 - 7
10520	FIRE PROTECTION SPECIALTIES	1 - 2
10800	TOILET ACCESSORIES	1 - 3
<u>DIVISION 11 - EQUIPMENT</u>		
11132	PROJECTION SCREENS	1 - 4
<u>DIVISION 12 - FURNISHINGS</u>		
12345	STEEL LABORATORY CASEWORK	1 - 23
12492	VERTICAL LOUVER BLINDS	1 - 5

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
<u>DIVISION 13 - SPECIAL CONSTRUCTION</u>		
“Not Used”		
<u>DIVISION 14 - CONVEYING SYSTEMS</u>		
“Not Used”		
<u>DIVISION 15 - MECHANICAL</u>		
15005	GENERAL MECHANICAL REQUIREMENTS	1 - 11
15105	PIPES AND PIPE FITTINGS	1 - 5
15110	VALVES	1 - 6
15115	ELECTRIC MOTORS	1 - 4
15120	PIPING SPECIALTIES	1 - 4
15150	SUPPORTS, ANCHORS AND SEALS	1 - 5
15160	MECHANICAL IDENTIFICATION	1 - 4
15170	ACCESS DOORS	1 - 2
15180	TESTING, CLEANING, AND STERILIZATION OF PIPING SYSTEMS	1 - 2
15190	EXCAVATION AND BACKFILL	1 - 2
15230	DUCTWORK INSULATION	1 - 3
15405	INSULATION FOR PLUMBING EQUIPMENT AND PIPING	1 - 3
15410	PLUMBING PIPING	1 - 4
15430	PLUMBING SPECIALTIES	1 - 4
15440	PLUMBING FIXTURES	1 - 10
15445	COMPRESSED AIR SYSTEM	1
15446	CENTRAL VACUUM SYSTEM	1
15459	DI WATER SYSTEM	1 - 2
15730	UNITARY AIR CONDITIONING EQUIPMENT	1 - 6
15810	FANS	1 - 3
15840	DUCTWORK	1 - 6
15855	DUCTWORK ACCESSORIES	1 - 4
15860	GRILLES, REGISTERS AND CEILING DIFFUSERS	1 - 2
15895	CHEMICAL FUME EXHAUST DUCT SYSTEM	1 - 2
15985	TESTING, BALANCING AND COMMISSIONING OF MECHANICAL SYSTEMS	1 - 5

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGES</u>
<u>DIVISION 16 - ELECTRICAL</u>		
16010	GENERAL ELECTRICAL REQUIREMENTS	1 - 11
16060	GROUNDING AND BONDING	1 - 5
16075	ELECTRICAL IDENTIFICATION	1 - 3
16112	SURFACE RACEWAYS	1 - 4
16123	600 VOLT OR LESS CABLE	1 - 7
16130	RACEWAYS AND BOXES	1 - 11
16135	OUTLET BOXES AND FITTINGS	1 - 6
16139	CABLE TRAYS	1 - 4
16140	WIRING DEVICES	1 - 8
16190	SUPPORTING DEVICES	1 - 3
16410	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	1 - 5
16442	PANELBOARDS	1 - 2
16491	FUSES	1 - 2
16501	LAMPS	1
16511	INTERIOR LIGHTING	1 - 8

END OF TABLE OF CONTENTS

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01005 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE AND INTENT

A. Description:

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

B. Work Included:

1. The Contractor shall furnish all labor, superintendence, materials, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, shop drawings, working drawings and other means of construction necessary or proper for performing and completing the work. He shall obtain and pay for all required permits necessary for the work, other than those permits such as the DEP permit and railroad permit which may have already been obtained. He shall perform and complete the work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.
2. The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefor.
3. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment, prior approval of the Engineer notwithstanding.

C. Public Utility Installations and Structures:

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

2. The Contractor shall protect all public utility installations and structures from damage during the work. Access across any buried public utility installation or structure shall be made only in such locations and by means approved by the Engineer. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor which are shown on the Plans or have been located in the field by the utility shall be repaired by the Contractor, at his expense, as approved by the Engineer. No separate payment shall be made for such protection or repairs to public utility installations or structures.
3. Public utility installations or structures owned or controlled by the Owner or other governmental body, which are required by this contract to be removed, relocated, replaced or rebuilt by the Contractor not identified in any separate bid item shall be considered as a part of the general cost of doing the work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefor.
4. Where public utility installations or structures owned or controlled by the Owner or other governmental body are encountered during the course of the work, and are not indicated on the Plans or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement or rebuilding is necessary to complete the work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the Engineer, for the contractor to accomplish. If such work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be in accordance with the General and Supplemental General Conditions.
5. All Owner and other governmental utility departments and other owners of public utilities which may be affected by the work will be informed in writing by the Engineer within two weeks after the execution of the Contract or Contracts covering the work. Such notice will set out, in general, and direct attention to, the responsibilities of the Owner and other governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the work and will be accompanied by one set of Plans and Specifications covering the work under such Contract or Contracts.
6. In addition to the general notice given by the Engineer, the Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight hours in advance of breaking ground in any area or on any unit of the work. This can be accomplished by making the appropriate contact with the "Sunshine State One-Call of Florida, Inc. Call Center ("Call Sunshine") and per all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).

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

1.02 PLANS AND SPECIFICATIONS

A. Plans:

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

B. Copies Furnished to Contractor:

1. The Contractor shall furnish each of the subcontractors, manufacturers, and material men such copies of the Contract Documents as may be required for their work. Additional copies of the Plans and Specifications, when requested, may be furnished to the Contractor at cost of reproduction.

C. Supplementary Drawings:

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

D. Contractor to Check Plans and Data:

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

E. Specifications:

1. The Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

F. Intent:

1. All work called for in the Specifications applicable to this Contract, but not shown on the Plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Plans or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.
3. The inclusion of the Related Requirements (or work specified elsewhere) in the General part of the specifications is only for the convenience of the Contractor, and shall not be interpreted as a complete list of related Specification Sections.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. The names of proposed manufacturers, material men, suppliers and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for approval. Such approval must be obtained before shop drawings will be checked. No manufacturer will be approved for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. He shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.
2. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
3. Any two or more pieces or material or equipment of the same kind, type or classification, and being used for identical types of services, shall be made by the same manufacturer.

B. Delivery:

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

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.
2. Spare parts shall be furnished as specified.
3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rating data.

D. Installation of Equipment:

1. The Contractor shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character.
2. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise by the Engineer during installation. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.
3. The Contractor shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the Engineer and made of ample size and strength for the purpose intended. Substantial templates and working drawings for installation shall be furnished.
4. The Contractor shall, at his own expense, furnish all materials and labor for, and shall properly bed in non-shrink grout, each piece of equipment on its supporting base that rests on masonry foundations.
5. Grout shall completely fill the space between the equipment base and the foundation. All metal surfaces coming in contact with concrete or grout shall receive a coat of coal tar epoxy equal to Koppers 300M.

E. Service of Manufacturer's Engineer:

1. The Contract prices for equipment shall include the cost of furnishing (as required by equipment specifications sections) a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General:

1. Inspection and testing of materials will be performed by the Owner unless otherwise specified.
2. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Three (3) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.
3. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract, the Contractor will be notified thereof and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the Owner.
4. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.
5. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

B. Costs:

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

2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the Contract price.
3. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests on materials and equipment which are rejected for non-compliance.

C. Inspections of Materials:

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

D. Certificate of Manufacture:

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

E. Shop Tests of Operating Equipment:

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

2. Five copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company, shall be forwarded to the Engineer for approval.
3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

F. Preliminary Field Tests:

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

G. Final Field Tests:

1. Upon completion of the work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance tests as specified or required to prove compliance with the Contract Documents.
2. The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment and instruments necessary for all acceptance tests, at no additional cost to the Owner. The Supplier shall assist in the final field tests as applicable.

H. Failure of Tests:

1. Any defects in the materials and equipment or their failure to meet the tests, guarantees or requirements of the Contract Documents shall be promptly corrected by the Contractor by replacement or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to make these corrections or if the improved materials and equipment, when tested, shall again fail to meet the guarantees of specified requirements, the Owner, notwithstanding its partial payment for work, and materials and equipment, may reject the materials and equipment and may order the Contractor to remove them from the site at his own expense.
2. In case the Owner rejects any materials and equipment, then the Contractor shall replace the rejected materials and equipment within a reasonable time. If he fails to do so, the Owner may, after the expiration of a period of thirty (30) calendar days after giving him notice in writing, proceed to replace such rejected materials and equipment, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under his Contract.

I. Final Inspection:

1. During such final inspections, the work shall be clean and free from water. In no case will the final pay application be prepared until the Contractor has complied with all requirements set forth and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Document.

1.05 TEMPORARY STRUCTURES

A. Temporary Fences:

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

1.06 TEMPORARY SERVICES

A. First Aid:

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

1.07 LINES AND GRADES

A. Grade:

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

B. Safeguarding Marks:

1. The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.
2. The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

C. Datum Plane:

1. All elevations indicated or specified refer to the Mean Sea Level Datum of the NGVD 1929 Datum and/or NAVD 1988.

1.08 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility:

1. The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the work. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Plans, and the removal, relocation and reconstruction of such items called for on the Plans or specified shall be included in the various Contract Items and no separate payments will be made therefor. Where such public and private property, structures of any kind and appurtenances thereto are not shown on the Plans and when, in the opinion of the Engineer, additional work is deemed necessary to avoid interference with the work, payment therefore will be made as provided for in the General Conditions.
2. Contractor is expressly advised that the protection of buildings, structures, tunnels, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the Contractor.
3. Contractor shall, before starting operations, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the Owner and to the satisfaction of the Engineer. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be given to the Engineer.
4. Prior to the beginning of any excavations, the Contractor shall advise the Engineer of all buildings or structures on which he intends to perform work or which performance of the project work will affect.

B. Protection of Trees:

1. All trees and shrubs shall be adequately protected by the Contractor with boxes and otherwise and in accordance with ordinances governing the protection of trees. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by him with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.
2. Beneath trees or other surface structures, where possible, pipelines may be built in short tunnels, backfilled with excavated materials, except as otherwise specified, or the trees or structures carefully supported and protected from damage.
3. The Owner may order the Contractor, for the convenience of the Owner, to remove trees along the line or trench excavation. If so ordered, the Owner will obtain any permits required for removal of trees. Such tree removal ordered shall be paid for under the appropriate Contract Items.

C. Lawn Areas:

1. Lawn areas shall be left in as good condition as before the starting of the work. Where sod is to be removed, it shall be carefully removed, and later replaced, or the area where sod has been removed shall be restored with new sod in the manner described in the Workmanship and Materials Paragraph in Section 02485, Seeding & Sodding.

D. Restoration of Fences:

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

1.09 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights:

1. During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the work causes obstructions to the normal traffic or constitutes in any way a hazard to the public, in accordance with state and local requirements.

B. Smoke Prevention:

1. A strict compliance with ordinances regulating the production and emission of smoke will be required. No open fires will be permitted.

C. Noise:

1. The Contractor shall eliminate noise to as great an extent as practicable at all times. Air compressing plants shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be provided with mufflers. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.
2. Except in the event of an emergency, no work shall be done between the hours of 7:00 P.M. and 7:00 A.M., or on weekends. If the proper and efficient prosecution of the work requires operations during the night or weekends, the written permission of the Owner shall be obtained before starting such items of the work.

D. Access to Public Services:

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

E. Dust Prevention:

1. The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas sprinkled with water at all times.

1.10 CUTTING AND PATCHING

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

1.11 CLEANING

A. During Construction:

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

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

B. Final Cleaning:

1. At the conclusion of the work, all equipment, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and he shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances.
2. The Contractor shall thoroughly clean all equipment and materials installed by him and shall deliver such materials and equipment undamaged in a bright, clean, polished and new operating condition.

1.12 MISCELLANEOUS

A. Protection Against Siltation and Bank Erosion:

1. The Contractor shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches.
2. The Contractor, at his own expense, shall remove any siltation deposits and correct any erosion problems as directed by the Engineer which results from his construction operations.

B. Protection of Wetland Areas:

1. The Contractor shall properly dispose of all surplus material, including soil, in accordance with Local, State and Federal regulations. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Florida Department of Environmental Protection or Southwest Florida Water Management District.

C. Existing Facilities:

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

D. Use of Chemicals:

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

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01005

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS/REQUIREMENTS INCLUDED

- A. The work included in this Contract consists of the partial renovation of approximately 2,500 square feet of the old laboratory area within the existing Administration Building for the Manatee County Southwest Regional Wastewater Treatment Plant (SWRWTP). Work shall include demolition and remodeling with associated architectural, mechanical, electrical, and plumbing work.
- B. The Contractor shall furnish all shop drawings, working drawings, labor, materials, equipment, tools, services and incidentals necessary to complete all work required by these Specifications and as shown on the Contract Drawings.
- C. The Contractor shall perform the work complete, in place and ready for continuous service and shall include any repairs, replacements, and/or restoration required as a result of damages caused prior to acceptance by the Owner.
- D. The Contractor shall furnish and install all materials, equipment and labor which is reasonably and properly inferable and necessary for the proper completion of the work, whether specifically indicated in the Contract Documents or not.

1.02 CONTRACTS

- A. Construct all the Work under a single contract.

1.03 WORK SEQUENCE

- A. All work done under this Contract shall be done with a minimum of inconvenience to the users of the system or facility. The Contractor shall coordinate his work with private property owners such that existing utility services are maintained to all users to the maximum extent possible.
- B. The Contractor shall, if necessary and feasible, construct the work in stages to accommodate the Owner's use of the premises during the construction period; coordinate the construction schedule and operations with the Owner's Representative.
- C. The Contractor shall, where feasible, construct the Work in stages to provide for public convenience and not close off public use of any facility until completion of construction to provide alternative usage.

1.04 CONSTRUCTION AREAS

- A. The Contractor shall: Limit his use of the construction areas for work and for storage, to allow for:
 - 1. Work by other Contractors.

2. Owner's Use.
3. Public Use.

- B. Coordinate use of work site under direction of Engineer or Owner's Representative.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
- D. Move any stored products under the Contractor's control, which interfere with operations of the Owner or separate contractor.
- E. Obtain and pay for the use of additional storage of work areas needed for Contractor operations.

1.05 OWNER OCCUPANCY

- A. It is assumed that portions of the Work will be completed prior to completion of the entire Work. Upon completion of construction of each individual facility, including testing, if the Owner, at its sole discretion, desires to accept the individual facility, the Contractor will be issued a dated certificate of completion and acceptance for each individual facility. The Owner will assume ownership and begin operation of the individual facility on that date and the three-year guaranty period shall commence on that date. The Owner has the option of not accepting the entire work as a whole until it is completed, tested and approved by the Engineer and Owner.

1.06 PARTIAL OWNER OCCUPANCY

- A. The Contractor shall schedule his operations for completion of portions of the Work, as designated, for the Owner's occupancy prior to substantial completion of the entire work.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01010

SECTION 01015 - CONTROL OF WORK

PART 1 - GENERAL

1.01 WORK PROGRESS

- A. The Contractor shall furnish personnel and equipment which will be efficient, appropriate and adequately sized to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Contract. If at any time such personnel appears to the Engineer to be inefficient, inappropriate, or insufficient for securing the quality of work required for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character, or increase the personnel and equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE LAND

- A. The Contractor shall not enter or occupy private land outside of easements, except by permission of the adjacent property owner.

1.03 WORK LOCATIONS

- A. Work shall be located substantially as indicated on the drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons.

1.04 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.
- B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be barricaded and well lighted at all times when construction is not in progress.

1.05 DISTRIBUTION SYSTEMS AND SERVICES

- A. The Contractor shall avoid interruptions to water, telephone, cable TV, sewer, gas, or other related utility services. He shall notify the Engineer and the appropriate agency well in advance of any requirement for dewatering, isolating, or relocating a section of a utility, so that necessary arrangements may be made.
- B. If it appears that utility service will be interrupted for an extended period, the Engineer may order the Contractor to provide temporary service lines at the Contractor's expense. Inconvenience of the users shall be kept to the minimum, consistent with existing conditions. The safety and integrity of the systems are of prime importance in scheduling work.

1.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures and utilities, public or private, including poles, signs, services to building utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables and other similar facilities, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operation shall be repaired by the Contractor at his expense.
- B. The Contractor shall bear full responsibility for obtaining locations of all underground structures and utilities (including existing water services, drain lines and sewers). Services to buildings shall be maintained and all costs or charges resulting from damage thereto shall be paid by the Contractor.
- C. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit prices established in the Bid.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the Owner is required, he may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work as classified in the General Conditions. If relocation of a privately owned utility is required, the Owner will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and utility and shall have no claim for delay due to such relocation. The Contractor shall notify public utility companies in writing at least 48 hours (excluding Saturdays, Sundays and legal holidays) before excavating near their utilities.

1.07 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor at the direction of the Engineer. Test pits shall be backfilled immediately after the utility location and the surface shall be restored in a manner equal or better than the original condition. No separate payment will be made.

1.08 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition equal or better to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the Engineer.
- B. All sidewalks which are disturbed by the Contractor's operations shall be restored to their original or better condition by the use of similar or comparable materials. All curbing shall be restored in a condition equal to the original construction and in accordance with the best modern practice.
- C. Along the location of this work, all fences, walks, bushes, trees, shrubbery and other physical features shall be protected and restored in a thoroughly workmanlike manner unless otherwise shown on the drawings. Fences and other features removed by the Contractor shall be replaced in the location indicated by the Engineer as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regraded and sodded to equal or exceed original conditions.
- D. Trees close to the work which drawings do not specify to be removed, shall be boxed or otherwise protected against injury. The Contractor shall trim all branches that are liable to damage because of his operations, but in no case shall any tree be cut or removed without prior notification to the Engineer. All injuries to bark, trunk, limbs and roots of trees shall be repaired by dressing, cutting and painting according to approved methods, using only approved tools and materials.
- E. The protection, removal and replacement of existing physical features along the line of work shall be a part of the work under the Contract and all costs in connection therewith shall be included in the unit and/or lump sum prices established under the items in the Bid.

1.09 MAINTENANCE OF TRAFFIC

- A. Open pits, trenches, unpaved streets, debris, or other obstructions due to construction that will prevent the normal flow of traffic during an extended construction stoppage, for any reason, shall be minimized. In the event an extended construction stoppage is found to be necessary, Contractor shall, at his own expense, provide normal traffic flow during extended construction stoppage. Extended stoppage will be defined by the Engineer.
- B. All excavated material shall be placed so that vehicular and pedestrian traffic may be maintained at all times. If the Contractor's operations cause traffic hazards, he shall repair the road surface, provide temporary roadways, erect wheel guards or fences, or take other safety measures which are satisfactory to the Engineer and Owner.

- C. Detours around construction areas will be subject to the approval of the Owner and the Engineer. Where detours are permitted, the contractor shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the Contractor shall expedite construction operations and periods when traffic is being detoured, will be strictly controlled by the Owner.

1.10 WATER FOR CONSTRUCTION PURPOSES

- A. In locations where public water supply is available, the Contractor may purchase water for all construction purposes.
- B. The Contractor shall be responsible for paying for all water tap fees incurred for the purpose of obtaining a potable water service or hydrant meter.

1.11 MAINTENANCE OF FLOW

- A. The Contractor shall at his own cost, provide for the flow of sewers, drains and water courses interrupted during the progress of the work and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer and Owner well in advance of the interruption of any flow.

1.12 CLEANUP

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and neat a condition as is possible. He shall dispose of all residue resulting from the construction work and at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.

1.13 COOPERATION WITHIN THIS CONTRACT

- A. All firms or person authorized to perform any work under this Contract shall cooperate with the General Contractor and his subcontractors or trades and shall assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.14 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the Contractor at his own expense.

- B. All structures shall be protected in a manner approved by the Engineer. Should any of the floors or other parts of the structures become heaved, cracked, or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor, at his own expense and to the satisfaction of the Engineer. If, in the final inspection of the work, any defects, faults, or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the warranty period described in the Contract.
- C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

1.15 CONSTRUCTION WITHIN RIGHT-OF-WAY

- A. Where pipe lines are installed within FDOT right-of-way, all excavation backfill and compaction for the purpose of reconstructing roadways and/or adjacent slopes contiguous thereto shall be in accordance with FDOT or Manatee County Standards and Specifications, whichever is applicable. Contractor shall satisfy the authorized representative of the FDOT with respect to proper safety procedures, construction methods, required permitting, etc., within the FDOT right-of-way.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01015

SECTION 01020 – OWNER'S ALLOWANCES

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Owner's allowances in the amounts indicated, and as described below have been established for certain types of Work. The Contractor shall perform such Work only upon receipt of written Work Orders from the Architect and/or Owner. For this purpose, A Work Order shall have the same meaning for requirements pertaining to (submittals, approvals, etc.) as in Article 1 – DEFINITIONS, Work Directive Change of Section 00700 - GENERAL CONDITIONS, as modified, except the Work Order is only signed by the Architect and/or Owner.
- B. If the Work Order directs that the Allowance Work be performed, the provisions of Section 00700 - GENERAL CONDITIONS, as modified, and Section 01152 - REQUESTS FOR PAYMENT shall govern the conduct and payment for this Work.
- C. Definitions and Explanations: Certain requirements of the Work related to each allowance are shown and specified in the Contract Documents. The allowance has been established in lieu of additional requirements for that Work, and further requirements thereof (if any) will be issued by Work Order.
 1. Coordinate allowance Work with related Work to ensure that each selection is completely integrated and interfaced with related Work.
- D. "Purchase and Installation" means the allowance covers both the purchase and installation of the indicated Work. The Contractor shall bear the cost of coordinating the Work, providing the installer with access to the Work, temporary heat, ventilation, light, workspace, storage space, parking and toilet facilities, the cost of which shall be included in the Contract Sum and not in the allowance.
- E. Work Order Data: Where applicable, include in each Work Order Proposal both the quantities of products being purchased and unit requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts.
- F. Work Order Mark-Up: The amount of each Work Order resulting from final selection and installation of products and systems covered by an allowance shall be the difference between amount of installed Work and the allowance.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF OWNER'S ALLOWANCES

- A. These allowances shall cover the net cost of the materials and equipment delivered and unloaded at the Site, all applicable taxes, labor and installation costs as applicable. The Contractor's percentage, overhead, and profit for the allowance shall be included in the allowance amount.
- B. Should the aggregate of charges for all approved Work Orders issued by the Architect and/or Owner under the Allowances be less than the amount of the Allowance, the Final Contract Sum shall be decreased by the amount of the difference. No Work shall be performed that would cause total charges under the Allowances to exceed the authorized allowance amount. The authorized allowance amount may be increased by Change Order.
- C. The following allowance amounts shall be included in the Contract Sum Bid Amount on the Bid Form:
 - 1. OWNER'S ALLOWANCE NO. 1: Allow an amount of \$ 25,000.00 for:
 - a. Purchase and installation of all additional materials and/or equipment required to complete the Work of this Contract where materials and/or equipment in Owner's existing inventory is not sufficient or has been damaged and needs replaced.
 - b. Refer to individual specification sections and coordinate with Owner for items identified as existing inventory.
- D. Contract Time shall not be extended as a result of the issuance of any Work Order under this Section 01020 – OWNER'S ALLOWANCES.
- E. The Contract Sum shall not be adjusted for any costs of acceleration resulting from the issuance of Work Orders under this Section 01020 – OWNER'S ALLOWANCES. In addition, the Contract Sum shall not be adjusted for any costs of acceleration of the Whole Work resulting from the issuance of Work Orders under this Section 01020 – OWNER'S ALLOWANCES.

END OF SECTION 01020

SECTION 01030 - SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 PERMITS

- A. Upon notice of award, the Contractor shall immediately apply for all applicable permits not previously obtained by the Owner to do the work from the appropriate governmental agency or agencies. No work shall commence until all applicable permits have been obtained and copies delivered to the Engineer. The costs for obtaining all permits shall be borne by the Contractor.

1.02 CONNECTIONS TO EXISTING SYSTEM

- A. The Contractor shall perform all work necessary to locate, excavate and prepare for connections to the terminus of the existing systems all as shown on the Drawings or where directed by the Owner/Engineer. The cost for this work and for the actual connection to the existing systems shall be included in the price bid for the project and shall not result in any additional cost to the Owner. The termination point for each contract shall be as shown on the Contract Drawings.

1.03 RELOCATIONS

- A. The Contractor shall be responsible for the coordination of the relocation of structures, including but not limited to light poles, power poles, signs, sign poles, fences, piping, conduits and drains that interfere with the positioning of the work as set out on the Drawings. No relocation of the items under this Contract shall be done without approval from the Engineer.

1.04 EXISTING UNDERGROUND PIPING, STRUCTURES AND UTILITIES

- A. The attention of the Contractor is drawn to the fact that during excavation, the possibility exists of the Contractor encountering various water, sewer, gas, telephone, electrical, or other utility lines not shown on the Drawings. The Contractor shall exercise extreme care before and during excavation to locate and flag these lines as to avoid damage to the existing lines. Cost for relocation of all existing lines shall be included in the price bid for the project. Should damage occur to an existing line, the Contractor shall bear the cost of all repairs.
- B. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability of which may be endangered by the close proximity of excavation, are temporarily stayed in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation by the Contractor.

- C. The existing utility locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered. The Contractor shall be responsible for notifying the various utility companies to locate their respective utilities in advance of construction in conformance with all requirements provided for in the Florida Underground Facilities Damage Prevention and Safety Act (Florida Statutes, Title XXXIII, Chapter 556).
- D. The existing piping and utilities that interfere with new construction shall be rerouted as shown, specified, or required. Before any piping and utilities not shown on the Drawings are disturbed, the Contractor shall notify the Engineer of the location of the pipeline or utility and shall reroute or relocate the pipeline or utility as directed. Cost for relocation of existing pipelines or utilities shall be included in the price bid for the project.
- E. The Contractor shall exercise care in any excavation to locate all existing piping and utilities. All utilities which do not interfere with complete work shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the Engineer and/or the owner of the utility.
- F. It is intended that wherever existing utilities such as water, sewer, gas, telephone, electrical, or other service lines must be crossed, deflection of the pipe within recommended limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated in the Drawings. However, when in the opinion of the Engineer this procedure is not feasible, he may direct the use of fittings for a utilities crossing as detailed on the Drawings. No deflections will be allowed in gravity sanitary sewer lines or in existing storm sewer lines.

1.05 SUSPENSION OF WORK DUE TO WEATHER

- A. Refer to FDOT Standards and Specifications Book, Section 8.

1.06 HURRICANE PREPAREDNESS PLAN

- A. Within 30 days of the date of Notice to Proceed, the Contractor shall submit to the Engineer and Owner a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the Owner in case of a hurricane warning.
- B. In the event of inclement weather, or whenever Engineer shall direct, Contractor shall insure that he and his Subcontractors shall carefully protect work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any portion of work or materials is damaged due to the failure on the part of the Contractor or Subcontractors to protect the work, such work and materials shall be removed and replaced at the expense of the Contractor.

1.07 POWER SUPPLY

- A. Electricity as may be required for construction and permanent power supply, shall be secured and purchased by the Contractor.

1.08 SALVAGE

- A. Any existing equipment or material, including, but not limited to, valves, pipes, fittings, couplings, etc., which is removed or replaced as a result of construction under this project may be designated as salvage by the Engineer or Owner and if so shall be protected for a reasonable time until picked up by the Owner. Any equipment or material not worthy of salvaging, as directed by the Engineer, shall be disposed of by the Contractor at no additional cost.

1.09 DEWATERING

- A. The Contractor shall do all groundwater pumping necessary to prevent flotation of any part of the work during construction operations with his own equipment.
- B. The Contractor shall pump out water and wastewater which may seep or leak into the excavations for the duration of the Contract and with his own equipment. He shall dispose of this water in an appropriate manner.

1.10 ADDITIONAL PROVISIONS

- A. Before commencing work on any of the existing pipelines, structures or equipment, the Contractor shall notify the Engineer, in writing, at least 10 calendar days in advance of the date he proposes to commence such work.
- B. The Contractor shall provide, at his own expense, all necessary temporary facilities for access to and for protection of, all existing facilities. The Owner's personnel must have ready access at all times to the existing facilities. The Contractor is responsible for all damage to existing structures, equipment and facilities caused by his construction operations and must repair all such damage when and as ordered by the Engineer.

1.11 CONSTRUCTION CONDITIONS

- A. The Contractor shall strictly adhere to the specific requirements of the governmental unit(s) and/or agency(ies) having jurisdiction over the work. Wherever there is a difference in the requirements of a jurisdictional body and these Specifications, the more stringent shall apply.

1.12 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, excessive noise or dust.

- B. Sound levels must meet Manatee County Ordinance #87-34, (which amends Ordinance 81-3, The Manatee County Noise Control Ordinance). Sound levels in excess of such ordinance are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the Engineer or County for excessive noise shall not relieve the Contractor of the other portions of this specification including, but not limited to contract time and contract price.
- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

1.13 WARRANTIES

- A. All material supplied under these Specifications shall be warranted by the Contractor and the manufacturers for a period of three (3) years. Warranty period shall commence on the date of Owner acceptance.
- B. The material shall be warranted to be free from defects in workmanship, design and materials. If any part of the system should fail during the warranty period, it shall be replaced at no expense to the Owner.
- C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty or guarantee period. No exception to this provision shall be allowed. The Contractor shall be responsible for obtaining warranties from each of the respective suppliers or manufacturers for all the material specified under these contract specifications,
- D. In the event that the manufacturer is unwilling to provide a three-year warranty commencing at the time of Owner acceptance, the Contractor shall obtain from the manufacturer a four (4) year warranty starting at the time of equipment delivery to the job site. This four-year warranty shall not relieve the Contractor of the three-year warranty starting at the time of Owner acceptance of the equipment.

PART 2 – PRODUCTS

“Not used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01030

SECTION 01045 - CUTTING AND PATCHING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Provide penetrations of non-structural surfaces for installation of piping and electrical conduit.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Engineer. Do not proceed with work until Engineer has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value to integrity of affected portion of work.

- B. Provide devices and methods to protect other portions of project from damage.
- C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work and maintain excavations free from water.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Fit and adjust products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work which has been cut or removed; install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Replace surfaces airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

END OF SECTION 01045

SECTION 01050 - FIELD ENGINEERING AND SURVEYING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall provide and pay for field surveying service required for the project.
- B. The Contractor shall furnish and set all necessary stakes to establish the lines and grades as shown on the Contract Drawings and layout each portion of the Work of the Contract.
 - 1. All survey work required in execution of Project.
 - 2. All costs of construction layout shall be included in the unit and lump sum prices contained in the respective divisions of the Contract Bid Form.
 - 3. Civil, structural or other professional engineering services specified or required to execute Contractor's construction methods.

1.02 QUALIFICATION OF SURVEYOR AND ENGINEER

- A. All construction staking shall be conducted by or under the supervision of a Florida Registered Professional Surveyor and Mapper approved by the Owner. The Contractor shall be responsible for the layout of all such lines and grades, which will be subject to verification by the Engineer.

1.03 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are designated on the Contract Drawings.
- B. Locate and protect all survey monumentation, property corners and project control points prior to starting work and preserve all permanent reference points during construction. All costs associated with the replacement of all survey monumentation, property corners and project control points shall be borne by the Contractor.
 - 1. Make no changes or relocations without prior written notice to Engineer.
 - 2. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

3. Require surveyor to replace project control points which may be lost or destroyed.
4. Establish replacements based on original survey control.

1.04 PROJECT SURVEY REQUIREMENTS

- A. The Contractor shall establish temporary bench marks as needed, referenced to data established by survey control points.

1.05 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. The Contractor shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings on Mylar and 3-1/2" diskettes. The Record Drawings, together with two copies, shall be certified by the licensed professional and shall be submitted to the Owner/Engineer.

1.06 SUBMITTALS

- A. Submit name and address of Professional Surveyor and Mapper to Engineer for Owner's approval.
- B. Submit certificate signed by the Professional Surveyor and Mapper certifying that elevations and locations of improvements are in conformance, or nonconformance, with Contract Documents.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01050

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 DEFINITIONS

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes established stricter standards.
- B. Publication Date: The most recent publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES AND ADDRESSES OR ORGANIZATIONS

- A. Obtain copies of reference standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16th Street NW Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
AWS	American Welding Society 2501 N.W. 7th Street Miami, FL 33125
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FDEP	Florida Department of Environmental Protection 3900 Commonwealth Blvd. Tallahassee, Florida 32399
FDOT	Florida Department of Transportation Standards Specifications for Road and Bridge Construction Tallahassee, FL
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
MCUOD	Manatee County Utility Operations Department 4410 66th St. W. Bradenton, FL 34210
MLSFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
MMA	Monorail Manufacturer's Association 1326 Freeport Road Pittsburgh, PA 15238
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601

NEMA	National Electrical Manufacturer's Assoc. 2101 L Street N.W. Washington, DC 20037
OHSA	Occupational Safety and Health Assoc. 5807 Breckenridge Pkwy., Suite A Tampa, FL 33610-4249
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
SDI	Steel Door Institute 712 Lakewood Center North Cleveland, OH 44107
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 8224 Old Court House Road Vienna, VA 22180
SSPC	Steel Structures Painting Council Pittsburgh, PA
SWFWMD	Southwest Florida Water Management District 2379 Broad Street Brooksville, FL 34604-6899
UL	Underwriter's Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01090

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE

- A. The scope of this section of the Contract Documents is to further define the items included in each Bid Item in the Bid Form section of the Contract Documents. Payment will be made based on the specified items included in the description in this section for each bid item.
- B. All contract prices included in the Bid Form section will be full compensation for all shop drawings, working drawings, labor, materials, tools, equipment and incidentals necessary to complete the construction as shown on the Drawings and/or as specified in the Contract Documents to be performed under this Contract. Actual quantities of each item bid on a unit price basis will be determined upon completion of the construction in the manner set up for each item in this section of the Specifications. Payment for all items listed in the Bid Form will constitute full compensation for all work shown and/or specified to be performed under this Contract.

1.02 ESTIMATED QUANTITIES

The quantities shown are approximate and are given only as a basis of calculation upon which the award of the Contract is to be made. The Owner/Engineer does not assume any responsibility for the final quantities, nor shall the Contractor claim misunderstanding because of such estimate of quantities. Final payment will be made only for satisfactorily completed quantity of each item.

1.03 WORK OUTSIDE AUTHORIZED LIMITS

No payment will be made for work constructed outside the authorized limits of work.

1.04 MEASUREMENT STANDARDS

Unless otherwise specified for the particular items involved, all measurements of distance shall be taken horizontally or vertically.

1.05 AREA MEASUREMENTS

In the measurement of items to be paid for on the basis of area of finished work, the lengths and/or widths to be used in the calculations shall be the final dimensions measured along the surface of the completed work within the neat lines shown or designated.

1.06 LUMP SUM ITEMS

Where payment for items is shown to be paid for on a lump sum basis, no separate payment will be made for any item of work required to complete the lump sum items. Lump sum contracts shall be complete, tested and fully operable prior to request for final payment.

1.07 UNIT PRICE ITEM

Separate payment will be made for the items of work described herein and listed on the Bid Form. Any related work not specifically listed, but required for satisfactory completion of the work shall be considered to be included in the scope of the appropriate listed work items.

No separate payment will be made for the following items and the cost of such work shall be included in the applicable pay items of work. Final payments shall not be requested by the Contractor or made by the Owner until as-built (record) drawings have been submitted and approved by the Engineer.

1. Shop Drawings, Working Drawings.
2. Clearing, grubbing and grading except as hereinafter specified.
3. Trench excavation, including necessary pavement removal and rock removal, except as otherwise specified.
4. Dewatering and disposal of surplus water.
5. Structural fill, backfill, and grading.
6. Replacement of unpaved roadways, and shrubbery plots.
7. Cleanup and miscellaneous work.
8. Foundation and borrow materials, except as hereinafter specified.
9. Testing and placing system in operation.
10. Any material and equipment required to be installed and utilized for the tests.
11. Pipe, structures, pavement replacement, asphalt and shell driveways and/or appurtenances included within the limits of lump sum work, unless otherwise shown.
12. Maintaining the existing quality of service during construction.
13. Maintaining or detouring of traffic.
14. Appurtenant work as required for a complete and operable system.
15. Seeding and hydromulching.
16. As-built Record Drawings.

BID ITEM No. 1 - MOBILIZATION

Measurement and payment for this Bid Item shall include full compensation for the required 100 percent (100%) Performance Bond, 100 Percent (100%) Payment Bond, all required insurance for the project and the Contractor's mobilization and demobilization costs as shown in the Bid Form.

Payment shall also include full compensation for project photographs, as-builts record drawing, project signs, rubbish and spoil removal, repair, replacement or relocation of all

signs, walls, and related items and any and all other items required to complete the project in accordance with Contract Documents.

Payment for mobilization shall not exceed 10 percent (10%) of the total Contract cost unless the Contractor can prove to the Owner that his actual mobilization cost exceeds 10 percent (10%).

BID ITEM NO. 2 – RENOVATE BUILDING COMPLETE

Payment of the lump sum price established in the Schedule of Price shall be full compensation for furnishing all labor, materials, equipment and incidentals required to complete the renovation of the existing building complete as specified in Divisions 1 through 16 and as shown as the Drawings.

Payment under this lump sum shall also include all other appurtenances and related work which are not specified or shown but are required to complete the work as shown on the Drawings and specified herein.

BID ITEM NO. 3 - MISCELLANEOUS WORK AND CLEANUP

Payment for all work included under this Bid Item shall be made at the Contract lump sum price bid listed in the Bid Form and shall represent full compensation for all labor, materials and equipment required to perform all the work as shown on the Contract Drawings and specified herein and any other miscellaneous work not specifically included for payment under other Bid Items obviously necessary to complete the Contract. Partial payments will be based on the breakdown of the Bid Item in accordance with the Schedule of Values submitted by the Contractor and approved by the Engineer. Payment shall also include full compensation for project photographs, as-builts record drawings, rubbish and spoil removal, repair, replacement or relocation of all signs, walls, and related items and any and all other items required to complete the project in accordance with Contract Documents.

BID ITEM NO. 4 - DISCRETIONARY WORK

Payment for all work under this Bid Item and listed in the Bid Form shall be made only at the Owner's discretion in order to satisfactorily complete the project in accordance with the Plans and Specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01152 - REQUESTS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Applications for Payment to the Project Manager or as directed at the preconstruction meeting, in accordance with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.

1.02 FORMAT AND DATA REQUIRED

- A. Submit payment requests in the form provided by the Owner with itemized data typed in accordance with the Bid Form.
- B. Provide construction photographs in accordance with Contract Documents.

1.03 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information with a cover letter.
- B. Submit one copy of data and cover letter for each copy of application.

1.04 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments.

1.05 SUBMITTAL PROCEDURE

- A. Submit applications for payment at the times stipulated in the Agreement.
- B. Number: Three (3) copies of each application; all signed and certified by the Contractor.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01152

SECTION 01153 - CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 DEFINITION

- A. Change Order: See General Conditions.
- B. Field Directive Change: See General Conditions.

1.02 REQUIREMENTS INCLUDED

- A. The Contractor shall promptly implement change order procedures:
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on a time-and-material/force account basis.
 - 3. Provide full documentation to Engineer on request.
- B. The Contractor shall designate a member of the Contractor's organization who:
 - 1. Is authorized to accept changes to the Work.
 - 2. Is responsible for informing others in the Contractor's employ of the authorized changes into the Work.
- C. The Board of County Commissioners executes all Change Orders.

1.03 PRELIMINARY PROCEDURES

- A. Project Manager may initiate changes by submitting a Request to Contractor. Request will include:
 - 1. Detailed description of the change, products, costs and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.
 - 3. The projected time extension for making the change.
 - 4. A specified period of time during which the requested price will be considered valid.
 - 5. Such request is for information only and is not an instruction to execute the changes, nor to stop work in progress.

B. Contractor may initiate changes by submitting a written notice to the Project Manager, containing:

1. Description of the proposed changes.
2. Statement of the reason for making the changes.
3. Statement of the effect on the Contract Sum and the Contract Time.
4. Statement of the effect on the work of separate contractors.
5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.04 FIELD DIRECTIVE CHANGE

- A. In lieu of a Change Order, the Project Manager may issue a Field Directive change for the Contractor to proceed with additional work within the original intent of the Project.
- B. Field Directive change will describe changes in the work, with attachments of backup information to define details of the change.
- C. Contractor must sign and date the Field Directive change to indicate agreement with the terms therein.

1.05 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump sum proposal and for each unit price which has not previously been established, with sufficient substantiating data to allow the Engineer/Owner to evaluate the quotation.
- B. On request, provide additional data to support time and cost computations:
 1. Labor required.
 2. Equipment required.
 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 4. Taxes, insurance and bonds.
 5. Credit for work deleted from Contract, similarly documented.
 6. Overhead and profit.
 7. Justification for any change in Contract Time.

- C. Support each claim for additional costs and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information.
 - 1. Name of the Owner's authorized agent who ordered the work and date of the order.
 - 2. Date and time work was performed and by whom.
 - 3. Time record, summary of hours work and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and time of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.

1.06 PREPARATION OF CHANGE ORDERS

- A. Project Manager will prepare each Change Order.
- B. Form: see Section 00550 for sample form.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments as necessary to define details of the change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.07 LUMP SUM/FIXED PRICE CHANGE ORDER

- A. Project Manager initiates the form, including a description of the changes involved and attachments based upon documents and proposals submitted by the Contractor, or requests from the Owner, or both.
- B. Once the form has been completed, all copies should be sent to Contractor for approval. After approval by Contractor, all copies should be sent to Owner for approval. The Owner will distribute executed copies after approval by the Board of County Commissioners.

1.08 UNIT PRICE CHANGE ORDER

- A. Contents of Change Orders will be based on, either:
 - 1. Owner's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as approved by the Owner.
 - 3. Survey of completed work.

B. The amounts of the unit prices to be:

1. Those stated in the Agreement.
2. Those mutually agreed upon between Owner and Contractor.

1.09 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/CONSTRUCTION CHANGE AUTHORIZATION

- A. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
- B. Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.
- C. Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
- D. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.

1.10 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Schedule of Values and Application for Payment forms to record each change as a separate item of work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
 1. Revise sub schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01153

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Owner or Engineer shall schedule the pre-construction meeting, periodic progress meetings and special meetings, if required, throughout progress of work.
- B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 PRE-CONSTRUCTION MEETING

A. Attendance:

- 1. Owner's Engineer/Architect.
- 2. Owner's Project Manager
- 3. Contractor.
- 4. Resident Project Representative.
- 5. Related Labor Contractor's Superintendent.
- 6. Major Subcontractors.
- 7. Major Suppliers.
- 8. Others as appropriate.

B. Suggested Agenda:

- 1. Distribution and discussion of:
 - a. List of major subcontractors.
 - b. Projected Construction Schedules.
 - c. Coordination of Utilities
- 2. Critical work sequencing.
- 3. Project Coordination.
 - a. Designation of responsible personnel.
 - b. Emergency contact persons with phone numbers.

4. Procedures and processing of:
 - a. Field decisions.
 - b. Submittals.
 - c. Change Orders.
 - d. Applications for Payment.
5. Procedures for maintaining Record Documents.
6. Use of premises:
 - a. Office, work and storage areas.
 - b. Owner's requirements.
7. Temporary utilities.
8. Housekeeping procedures.
9. Liquidated damages.
10. Equal Opportunity Requirements.
11. Laboratory testing.
12. Job meetings.

1.03 PROGRESS MEETINGS

- A. Schedule regular meetings. The progress meetings may be held every 30 days or less with the first meeting 30 days after the pre-construction meeting.
- B. Hold special meetings as required.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01200

SECTION 01310 - CONSTRUCTION SCHEDULE & PROJECT RESTRAINTS

PART 1 - GENERAL

1.01 GENERAL

- A. Construction under this contract must be coordinated with the Owner and accomplished in a logical order to maintain utilization and flow through existing facilities and public properties and rights-of-way and to allow construction to be completed within the time allowed by Contract Documents and in the manner set forth in the Contract.

1.02 CONSTRUCTION SCHEDULING GENERAL PROVISIONS

- A. No work shall be done between 7:00 p.m. and 7:00 a.m. nor on weekends or legal holidays without written permission of the Owner. However, emergency work may be done without prior permission.
- B. Night work may be established by the Contractor as regular procedure with the written permission of the Owner. Such permission, however, may be revoked at any time by the Owner if the Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the work at night.
- C. Due to potential health hazards and requirements of the State of Florida and the U.S. Environmental Protection Agency, existing facilities must be maintained in operation.
- D. The Contractor shall be fully responsible for providing all temporary piping, plumbing, electrical hook-ups, lighting, temporary structure, or other materials, equipment and systems required to maintain the existing facility's operations. All details of temporary piping and temporary construction are not necessarily shown on the Drawings or covered in the Specifications. However, this does not relieve the Contractor of the responsibility to insure that construction will not interrupt proper facility operations.
- E. The Contractor shall designate an authorized representative of his firm who shall be responsible for development and maintenance of the schedule and of progress and payment reports. This representative of the Contractor shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the commitments of the Contractor's schedule.

1.03 PROGRESS OF THE WORK

- A. The work shall be executed with such progress as may be required to prevent any delay to the general completion of the work. The work shall be executed at such times and in or on such parts of the project and with such forces, materials and equipment to assure completion of the work in the time established by the Contract and in the manner set forth in the Contract.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. The Contractor shall submit a critical path schedule as described herein.
- B. The planning, scheduling, management and execution of the work is the sole responsibility of the Contractor. The progress schedule requirement is established to allow Engineer to review Contractor's planning, scheduling, management and execution of the work; to assist Engineer in evaluating work progress and make progress payments and to allow other contractors to cooperate and coordinate their activities with those of the Contractor.

2.02 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart diagram. The diagram shall be time-scaled and sequenced by work areas. Horizontal time scale shall identify the first work day of each week.
- B. Activities shall be at least as detailed as the Schedule of Values. Activity durations shall be in whole working days. In addition, man-days shall be shown for each activity or tabulated in an accompanying report.
- C. Diagrams shall be neat and legible and submitted on sheets at least 8-1/2 inches by 11 inches suitable for reproduction. Scale and spacing shall allow space for notations and future revisions.
- D. The schedules shall be prepared and submitted using the latest version of Microsoft Project, or other Owner approved software.

2.03 CONTENT OF SCHEDULES

- A. Each monthly schedule shall be based on data as of the last day of the current pay period.
- B. Description for each activity shall be brief, but convey the scope of work described.
- C. Activities shall identify all items of work that must be accomplished to achieve substantial completion, such as items pertaining to Contractor's installation and testing activities; items pertaining to the approval of regulatory agencies; contractor's time required for submittals, fabrication and deliveries; the time required by Engineer to review all submittals as set forth in the Contract Documents; items of work required of Owner to support pre-operational, startup and final testing; time required for the relocation of utilities. Activities shall also identify interface milestones with the work of other contractors performing work under separate contracts with Owner.
- D. Schedules shall show the complete sequence of construction by activities. Dates for beginning and completion of each activity shall be indicated as well as projected percentage of completion for each activity as of the first day of each month.

- E. Submittal schedule for shop drawing review, product data, and samples shall show the date of Contractor submittal and the date approved submittals will be required by the Engineer, consistent with the time frames established in the Specifications.
- F. For Contract change orders granting time extensions, the impact on the Contract date(s) shall equal the calendar-day total time extension specified for the applicable work in the Contract change orders.
- G. For actual delays, add activities prior to each delayed activity on the appropriate critical path(s). Data on the added activities of this type shall portray all steps leading to the delay and shall further include the following: separate activity identification, activity description indicating cause of the delay, activity duration consistent with whichever set of dates below applies, the actual start and finish dates of the delay or, if the delay is not finished, the actual start date and estimated completion date.
- H. For potential delays, add an activity prior to each potentially delayed activity on the appropriate critical path(s). Data for added activities of this type shall include alternatives available to mitigate the delay including acceleration alternatives and further show the following: separate activity identification, activity description indicating cause of the potential delay and activity duration equal to zero work days.

2.04 SUPPORTING NARRATIVE

- A. Status and scheduling reports identified below shall contain a narrative to document the project status, to explain the basis of Contractor's determination of durations, describe the Contract conditions and restraints incorporated into the schedule and provide an analysis pertaining to potential problems and practical steps to mitigate them.
- B. The narrative shall specifically include:
 1. Actual completion dates for activities completed during the monthly report period and actual start dates for activities commenced during the monthly report period.
 2. Anticipated start dates for activities scheduled to commence during the following monthly report period.
 3. Changes in the duration of any activity and minor logic changes.
 4. The progress along the critical path in terms of days ahead or behind the Contract date.
 5. If the Monthly Status Report indicates an avoidable delay to the Contract completion date or interim completion dates as specified in the Agreement, Contractor shall identify the problem, cause and the activities affected and provide an explanation of the proposed corrective action to meet the milestone dates involved or to mitigate further delays.

6. If the delay is thought to be unavoidable, the Contractor shall identify the problem, cause, duration, specific activities affected and restraints of each activity.
7. The narrative shall also discuss all change order activities whether included or not in the revised/current schedule of legal status. Newly introduced change order work activities and the CPM path(s) that they affect, must be specifically identified. All change order work activities added to the schedule shall conform with the sequencing and Contract Time requirements of the applicable Change Order.
8. Original Contract date(s) shall not be changed except by Contract change order. A revision need not be submitted when the foregoing situations arise unless required by Engineer. Review of a report containing added activities will not be construed to be concurrence with the duration or restraints for such added activities; instead the corresponding data as ultimately incorporated into the applicable Contract change order shall govern.
9. Should Engineer require additional data, this information shall be supplied by Contractor within 10 calendar days.

2.05 SUBMITTALS

- A. Contractor shall submit estimated and preliminary progress schedules (as identified in the Terms and Conditions of the Contract and the General Conditions), monthly status reports, a start-up schedule and an as-built schedule report all as specified herein.
- B. All schedules, including estimated and preliminary schedules, shall be in conformance with the Contract Documents.
- C. The finalized progress schedule discussed in the Contract Documents shall be the first monthly status report and as such shall be in conformance with all applicable specifications contained herein.
- D. Monthly Status Report submittals shall include three copies of a time-scaled (days after notice to proceed) diagram showing all contract activities and supporting narrative. The initial detailed schedule shall use the notice to proceed as the start date. The finalized schedule, if concurred with by Owner, shall be the work plan to be used by the contractor for planning, scheduling, managing and executing the work.
- E. The schedule diagram shall be formatted as above. The diagram shall include (1) all detailed activities included in the preliminary and estimated schedule submittals, (2) calendar days prior to substantial completion, (3) summary activities for the remaining days. The critical path activities shall be identified, including critical paths for interim dates, if possible.

- F. The Contractor shall submit monthly progress schedules with each month's application for payment.
- G. Contractor shall submit three monthly status reports which will be retained by the Owner and Engineer.

2.06 MONTHLY STATUS REPORTS

- A. Contractor shall submit three copies of detailed schedule status reports on a monthly basis with the Application for Payment. The first such status report shall be submitted with the first Application for Payment and include data as of the last day of the pay period. The Monthly Report shall include a "marked-up" copy of the latest detailed schedule of legal status and a supporting narrative including updated information as described above. The Monthly Report will be reviewed by Engineer and Contractor at a monthly schedule meeting and Contractor will address Engineer's comments on the subsequent monthly report. Monthly status reports shall be the basis for evaluating Contractor's progress.
- B. The "marked-up" diagram shall show, for the latest detailed schedule of legal status, percentages of completion for all activities, actual start and finish dates and remaining durations, as appropriate. Activities not previously included in the latest detailed schedule of legal status shall be added, except that contractual dates will not be changed except by change order. Review of a marked-up diagram by Engineer will not be construed to constitute concurrence with the time frames, duration, or sequencing for such added activities; instead the corresponding data as ultimately incorporated into an appropriate change order shall govern.

2.07 STARTUP SCHEDULE

- A. At least 60 calendar days prior to the date of substantial completion, Contractor shall submit a time-scaled (days after notice to proceed) diagram detailing the work to take place in the period between 60 days prior to substantial completion, together with a supporting narrative. Engineer shall have 10 calendar days after receipt of the submittal to respond. Upon receipt of Engineer's comments, Contractor shall make the necessary revisions and submit the revised schedule within 10 calendar days. The resubmittal, if concurred with by Owner, shall be the Work Plan to be used by Contractor for planning, managing, scheduling and executing the remaining work leading to substantial completion.
- B. The time-scaled diagram shall use the latest schedule of legal status for those activities completed ahead of the last 60 calendar days prior to substantial completion and detailed activities for the remaining 60-day period within the time frames outlined in the latest schedule of legal status.
- C. Contractor will be required to continue the requirement for monthly reports, as outlined above. In preparing this report, Contractor must assure that the schedule is consistent with the progress noted in the startup schedule.

2.08 REVISIONS

- A. All revised Schedule Submittals shall be made in the same form and detail as the initial submittal and shall be accompanied by an explanation of the reasons for such revisions, all of which shall be subject to review by Engineer and concurrence by Owner. The revision shall incorporate all previously made changes to reflect current as-built conditions. Minor changes to the approved submittal may be approved at monthly meetings; a minor change is not considered a revision in the context of this paragraph.
- B. A revised schedule submittal shall be submitted for review, when required by Engineer, for one of the following reasons:
 - 1. Owner or Engineer directs a change that affects the date(s) specified in the Agreement or alters the length of a critical path.
 - 2. Contractor elects a change that affects the date(s) specified in the Agreement or alters the length of a critical path.
- C. If, prior to agreement on an equitable adjustment to the Contract time, Engineer requires revisions to the schedule in order to evaluate planned progress, Contractor shall provide an interim revised submittal for review with change effect(s) incorporated as directed. Interim revisions to the documents which are recommended to the Owner for concurrence will be incorporated in the next Monthly Status Report.

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01310

SECTION 01340 - SHOP DRAWINGS, PROJECT DATA AND SAMPLES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the Engineer for review and approval: working drawings, shop drawings, test reports and data on materials and equipment (hereinafter in this section called data), and material samples (hereinafter in this section called samples) as are required for the proper control of work, including, but not limited to those working drawings, shop drawings, data and samples for materials and equipment specified elsewhere in the Specifications and in the Contract Drawings.
- B. Within thirty (30) calendar days after the effective date of the Agreement, the Contractor shall submit to the Engineer, a complete list of preliminary data on items for which Shop Drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items and the date on which each Shop Drawing shall be submitted. Review of this list by the Engineer shall in no way relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of Shop Drawings.
- C. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:
 1. Submittal description and number assigned.
 2. Date to Engineer.
 3. Date returned to Contractor (from Engineer).
 4. Status of Submittal (No exceptions taken, returned for confirmation or resubmittal, rejected).
 5. Date of Resubmittal and Return (as applicable).
 6. Date material released (for fabrication).
 7. Projected date of fabrication.
 8. Projected date of delivery to site.
 9. Projected date and required lead time so that product installation does not delay contract.
 10. Status of O&M manuals submitted.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. It is the duty of the Contractor to check all drawings, data and samples prepared by or for him before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the contract Documents.
- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with Specifications and indicate all variances from the Specifications.
- C. The Contractor shall furnish the Engineer a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.
- D. The Contractor shall not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with No Exceptions Taken or Approved As Noted.
- E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than twenty-one (21) calendar days for checking and appropriate action from the time the Engineer receives them.
- F. The Contractor shall submit five (5) copies of descriptive or product data submittals to complement shop drawings for the Engineer plus the number of copies which the Contractor requires. The Engineer shall retain five (5) sets. All blueprint shop drawings shall be submitted with one (1) set of 3 mil thick polyester film reproducibles. The Engineer will review the blueprints and return to the Contractor the set of marked-up sepias with appropriate review comments.
- G. The Contractor shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by Engineer of the necessary Shop Drawings.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS AND WORKING DRAWINGS

- A. The Engineer's review of drawings, data and samples submitted by the Contractor shall cover only general conformity to the Specifications, external connections and dimensions which affect the installation.
- B. The review of drawings and schedules shall be general and shall not be construed:
 - 1. As permitting any departure from the Contract requirements.
 - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions and materials.
 - 3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting any exception.
- D. When reviewed by the Engineer, each of the Shop and Working Drawings shall be identified as having received such review being so stamped and dated. Shop Drawings stamped "REJECTED" and with required corrections shown shall be returned to the Contractor for correction and resubmittal.
- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals, the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.
- F. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.
- G. The Engineer shall review a submittal/resubmittal a maximum of three (3) times after which cost of review shall be borne by the Contractor. The cost of engineering shall be equal to the Engineer's actual payroll cost.
- H. When the Shop and Working Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- I. No partial submittals shall be reviewed. Incomplete submittals shall be returned to the Contractor and shall be considered not approved until resubmitted.

1.04 SHOP DRAWINGS

- A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean Contractor's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, drawings, setting drawings, schedule drawings, manufacturer's scale drawings and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above.
- B. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval and original signature as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval and original signature shall be returned to the Contractor for resubmission.
- C. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:
 1. Number and title of the drawing.
 2. Date of Drawing or revision.
 3. Name of project building or facility.
 4. Name of contractor and subcontractor submitting drawing.
 5. Clear identification of contents and location of the work.
 6. Specification title and number.
- D. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility of executing the work in accordance with the Contract, even though such drawings have been reviewed.
- E. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.
- F. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

- G. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and have been in operation for a period of at least one (1) year.
- H. Only the Engineer will utilize the color "red" in marking shop drawing submittals.
- I. Before final payment is made, the Contractor shall furnish to Engineer project as-built drawings.

1.05 WORKING DRAWINGS

- A. When used in the Contract Documents, the term "working drawings" shall be considered to mean the Contractor's fabrication and erection drawings for structures such as roof trusses, steelwork, precast concrete elements, bulkheads, support of open cut excavation, support of utilities, groundwater control systems, forming and false work; underpinning; and for such other work as may be required for construction of the project.
- B. Copies of working drawings as noted above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer and shall be submitted at least thirty (30) days (unless otherwise specified by the Engineer) in advance of their being required for work.
- C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the Engineer, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the Contractor; the Owner and Engineer shall not have responsibility therefor.

1.06 SAMPLES

- A. The Contractor shall furnish, for the review of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until reviewed by the Engineer.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
 1. Functional characteristics of the product, with integrally related parts and attachment devices.
 2. Full range of color, texture and pattern.
 3. A minimum of two samples of each item shall be submitted.

C. Each sample shall have a label indicating:

1. Name of product.
2. Name of Contractor and Subcontractor.
3. Material or equipment represented.
4. Place of origin.
5. Name of Producer and Brand (if any).
6. Location in project.
(Samples of finished materials shall have additional markings that will identify them under the finished schedules.)
7. Reference specification paragraph.

D. The Contractor shall prepare a transmittal letter in triplicate for each shipment of samples containing the information required above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the Engineer. Review of a sample shall be only for the characteristics or use named in such and shall not be construed to change or modify any Contract requirements.

E. Reviewed samples not destroyed in testing shall be sent to the Engineer or stored at the site of the work. Reviewed samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the reviewed samples. If requested at the time of submission, samples which failed testing or were rejected shall be returned to the Contractor at his expense.

PART 2 - PRODUCTS

“Not Used”

PART 3 - EXECUTION

“Not Used”

END OF SECTION 01340

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall submit to the Engineer a Schedule of Values allocated to the various portions of the work, within 10 days after date of Notice to Proceed.
- B. Upon request of the Engineer, the Contractor shall support the values with data which will substantiate their correctness.
- C. The Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Schedule of Values will be considered for approval by Engineer upon Contractor's request. Identify schedule with:
 1. Title of Project and location.
 2. Project number.
 3. Name and address of Contractor.
 4. Contract designation.
 5. Date of submission.
- B. Schedule of Values shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents for the Contract Document as the format for listing component items for structures:
 1. Identify each line item with the number and title of the respective major section of the specification.
 2. For each line item, list sub values of major products or operations under item.
- D. Follow the bid sheets included in this Contract Documents as the format for listing component items for pipe lines.
- E. The sum of all values listed in the schedule shall equal the total Contract sum.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01370

SECTION 01380 - CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall employ a competent photographer to take construction record photographs or perform video taping, including furnishing all labor, materials, equipment and incidentals necessary to obtain photographs and/or video tapes of all construction areas.
- B. Preconstruction record information shall consist of video tapes.
- C. Construction progress information shall consist of photographs and digital photographs on a recordable compact disc (CD-R).

1.02 QUALIFICATIONS

- A. All photography shall be done by a competent camera operator who is fully experienced and qualified with the specified equipment.
- B. For the video recording, the audio portion should be done by a person qualified and knowledgeable in the specifics of the Contract, who shall speak with clarity and diction so as to be easily understood.

1.03 PROJECT PHOTOGRAPHS

- A. Provide two prints of each photograph with each pay application.
- B. Provide one recordable compact disc with digital photographs with each pay application.
- C. Negatives:
 - 1. All negatives shall remain the property of photographer.
 - 2. The Contractor shall require that photographer maintain negatives for a period of two years from date of substantial completion of the project.
 - 3. Photographer shall agree to furnish additional prints to Owner and Engineer at commercial rates applicable at time of purchase. Photographer shall also agree to participate as required in any litigation requiring the photographer as an expert witness.
- D. The Contractor shall pay all costs associated with the required photography and prints. Any parties requiring additional photography or prints shall pay the photographer directly.

- E. All project photographs shall be a single weight, color image. All finishes shall be smooth surface and glossy and all prints shall be 8 inches x 10 inches.
- F. Each print shall have clearly marked on the back, the name of the project, the orientation of view, the date and time of exposure, name and address of the photographer and the photographers numbered identification of exposure.
- G. All project photographs shall be taken from locations to adequately illustrate conditions prior to construction, or conditions of construction and state of progress. The Contractor shall consult with the Engineer at each period of photography for instructions concerning views required.

1.04 VIDEO TAPE RECORDINGS

- A. Video taping shall be done along all routes that are scheduled for construction. Video taping shall include full taping of both sides of all streets and the entire width of easements plus 10 feet on each side on which construction is to be performed. All video taping shall be in full color.
- B. A complete view, in sufficient detail with audio description of the exact location shall be provided.
- C. The engineering plans shall be used as a reference for stationing in the audio portion of the tapes for easy location identification.
- D. Two complete sets of video tapes shall be delivered to the Engineer for the permanent and exclusive use of the Engineer prior to the start of any construction on the project.
- E. All video tapes shall contain the name of the project, the date and time of the video taping, the name and address of the photographer and any other identifying information required.
- F. Construction shall not start until preconstruction video tapes are completed, submitted and accepted by the Engineer. In addition, no progress payments shall be made until the preconstruction video tapes are accepted by the Engineer.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01380

SECTION 01410 - TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Owner shall employ and pay for the services of an independent testing laboratory to perform testing specifically indicated on the Contract Documents or called out in the Specifications. Owner may elect to have materials and equipment tested for conformity with the Contract Documents at any time.
 - 1. Contractor shall cooperate fully with the laboratory to facilitate the execution of its required services.
 - 2. Employment of the laboratory shall in no way relieve the Contractor's obligations to perform the work of the Contract.

1.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work.
 - 3. Perform any duties of the Contractor.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work and/or to Manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor and no extra charge to the Owner shall be allowed on account of such testing and certification.

- E. Furnish incidental labor and facilities:
 - 1. To provide access to work to be tested.
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed due to insufficient notice, Contractor shall reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience and as approved by the Engineer.
- H. If the test results indicate the material or equipment complies with the Contract Documents, the Owner shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the contractor shall pay for the laboratory costs directly to the testing firm or the total of such costs shall be deducted from any payments due the Contractor.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01410

SECTION 01510 - TEMPORARY AND PERMANENT UTILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall be responsible for furnishing all requisite temporary utilities, i.e., power, water, sanitation, etc. The Contractor shall obtain and pay for all permits required as well as pay for all temporary usages. The Contractor shall remove all temporary facilities upon completion of work.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code.
- B. Comply with Federal, State and Local codes and regulations and with utility company requirements.
- C. Comply with County Health Department regulations.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials for temporary utilities may be "used". Materials for electrical utilities shall be adequate in capacity for the required usage, shall not create unsafe conditions and shall not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING

- A. Arrange with the applicable utility company for temporary power supply. Provide service required for temporary power and lighting and pay all costs for permits, service and for power used.

2.03 TEMPORARY WATER

- A. The Contractor shall arrange with Manatee County Utilities Customer Service office to provide water for construction purposes, i.e., meter, pay all costs for installation, maintenance and removal, and service charges for water used.
- B. The Contractor shall protect piping and fitting against freezing.

2.04 TEMPORARY SANITARY FACILITIES

- A. The Contractor shall provide sanitary facilities in compliance with all laws and regulations.
- B. The Contractor shall service, clean and maintain facilities and enclosures.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor shall maintain and operate systems to assure continuous service.
- B. The Contractor shall modify and extend systems as work progress requires.

3.02 REMOVAL

- A. The Contractor shall completely remove temporary materials and equipment when their use is no longer required.
- B. The Contractor shall clean and repair damage caused by temporary installations or use of temporary facilities.

END OF SECTION 01510

SECTION 01570 - TRAFFIC REGULATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the Contractor and which interfere with the driving or walking public.
- B. The Contractor shall remove temporary equipment and facilities when no longer required, restore grounds to original or to specified conditions.

1.02 TRAFFIC CONTROL

- A. The necessary traffic control shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, markings, barricades, channelization and hand signaling devices. The Contractor shall be responsible for installation and maintenance of all devices and detour routes and signage for the duration of the construction period. The Contractor shall utilize the appropriate maintenance of traffic plan from the FDOT Maintenance of Traffic Standards, Series 600 of the FDOT Roadway & Traffic Design Standards, Latest Edition.
- B. The Contractor shall provide at least 72 hours notification to the affected highway department of the necessity to close any portion of a roadway carrying vehicles or pedestrians so that final approval of such closings can be obtained at least 48 hours in advance. At no time will more than one (1) lane of a roadway be closed to vehicles and pedestrians without an approved road closure from the County Transportation Department. With any such closings, adequate provision shall be made for the safe expeditious movement of each. It shall also be the Contractor's responsibility to notify the School Board, police, fire and emergency departments whenever roads are impassable.
- C. The Contractor shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal preconstruction traffic control scheme. Any such actions shall be performed by the Contractor under the supervision and in accordance with the instructions of the applicable highway department unless otherwise specified.
- D. The Engineer will consult with the Owner immediately on any vehicular or pedestrian safety or efficiency problem incurred as a result of construction of the project.
- E. The Contractor shall provide ready access to businesses and homes in the project area during construction. The Contractor shall be responsible for coordinating this work with affected homeowners.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01570

SECTION 01580 - PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install and maintain County project identification signs.
- B. Remove signs on completion of construction.
- C. Allow no other signs to be displayed.

1.02 PROJECT IDENTIFICATION SIGN (COUNTY)

- A. One painted sign, of not less than 32 square feet (3 square meters) area, with painted graphic content to include:
 - 1. Title of Project.
 - 2. Name of Owner.
 - 3. Names and titles of authorities as directed by Owner.
 - 4. Prime Contractor.
- B. Graphic design, style of lettering and colors: As approved by the Engineer and subject to approval of the Owner.
- C. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the Engineer and the Owner

1.03 INFORMATIONAL SIGNS

- A. Painted signs with painted lettering, or standard products.
 - 1. Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.
 - 2. Colors: as required by regulatory agencies, otherwise of uniform colors throughout project.
- B. Erect at appropriate locations to provide required information.

1.04 QUALITY ASSURANCE

- A. Sign Painter: Professional experience in type of work required.
- B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: May be new or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.
- A. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.
 - 1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.
- C. Rough Hardware: Galvanized.
- D. Paint: Exterior quality, as specified in the Contract Documents.

PART 3 - EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

- A. Paint exposed surface or supports, framing and surface material; one coat of primer and one coat of exterior paint.
- B. Paint graphics in styles, size and colors selected.

3.02 MAINTENANCE

- A. The Contractor shall maintain signs and supports in a neat, clean condition; repair damages to structures, framing or sign.

3.03 REMOVAL

- A. The Contractor shall remove signs, framing, supports and foundations at completion of project.

END OF SECTION 01580

SECTION 01590 - ENGINEER'S FIELD OFFICE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall furnish, install and maintain one temporary field office during the entire construction period for the sole use of the Engineer.

1.02 OTHER REQUIREMENTS

- A. Prior to installation of the Engineer's field office, the Contractor shall consult with the Engineer on location, access and related facilities.
- B. All site use approvals shall be obtained by the Contractor.
- C. Upon completion of construction, the Contractor shall remove the field office and restore the site to its original condition.

1.03 REQUIREMENTS FOR FACILITIES

A. Construction:

- 1. The field office shall be structurally sound, weather tight, with floors raised aboveground.
- 2. At Contractor's option, portable or mobile buildings may be used.

B. Office for Field Engineer:

- 1. A separate office for sole use of the Engineer with secure entrance doors, key and lock shall be provided.
- 2. Area: 250 sq. ft. minimum, with minimum dimension of 8 feet.

3. Windows:

- a. Minimum of three (3).
- b. Operable sash and insect screens.
- c. Locate field office to provide maximum view of construction areas.

4. Furnishings:
 - a. Two standard size chairs and desks with three drawers each.
 - b. One drafting table: 39"x72"x36" high, with one equipment drawer.
 - c. One metal, double-door storage cabinet with lock and key.
 - d. One plan rack to hold a minimum of six sets of project drawings.
 - e. One standard four-drawer legal-size metal filing cabinet with lock and key.
 - f. Six linear feet of bookshelves.
 - g. One swivel arm chair.
 - h. Two straight chairs.
 - i. One drafting table stool.
 - j. One waste basket.
 - k. One tackboard, 36"x30".
 - l. One fire extinguisher.
 - m. One first aid kit.
5. Services:
 - a. Adequate lighting.
 - b. Exterior lighting at entrance door.
 - c. Automatic heating and mechanical cooling equipment to maintain comfort conditions.
 - d. Minimum of four 110 volt duplex electric convenience outlets, at least one on each wall.

- e. Electric distribution panel: Two circuits minimum 110 volt, 60 hertz service.
- f. Convenience access to drinking water and toilet facilities.
- g. Telephone: One private direct line instrument.
- h. Fax: combination fax/duplicator.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. May be new or used, but must be serviceable, adequate for required purpose and must adhere to all applicable codes or regulations including the Manatee County Building Codes.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Fill and grade site as necessary for temporary structure to provide positive surface drainage.

3.02 INSTALLATION

- A. Construct temporary field office on proper foundation and provide connections for all utility services.
 - 1. Secure portable or mobile building when used.
 - 2. Provide steps and landings at entrance doors.

END OF SECTION 01590

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Material and equipment incorporated into the work:
 1. Conform to applicable specifications and standards.
 2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer.
 3. Manufactured and Fabricated Products:
 - a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
 - c. Two or more items of the same kind shall be identical and manufactured by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 4. Do not use material or equipment for any purpose other than that for which it is specified.
 5. All material and equipment incorporated into the project shall be new.

1.02 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Engineer.
 1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 2. Do not proceed with work without clear instructions.

- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.

1.03 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
 - 1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 - 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.04 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible
 - 1. Store products subject to damage by the elements in weather tight enclosures.
 - 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- B. Exterior Storage:
 - 1. Store fabricated products above the ground, on blocking or skids to prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 - 2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.
- D. Protection After Installation:
 - 1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

1.05 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products List:

1. Within 30 days after Contract date, submit to Engineer a complete list of major products proposed to be used.

B. Contractor's Options:

1. For products specified only by reference standard, select any product meeting that standard.
2. For products specified by naming one or more products or manufacturers and "or equal", Contractor must submit a request for substitutions of any product or manufacturer not specifically named.
3. Requests for substitutions of products and "or equal" by the Contractor shall be submitted in a timely manner so as not to adversely affect the construction schedule.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01600

SECTION 01620 - STORAGE AND PROTECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide secure storage and protection for products to be incorporated into the work and maintenance and protection for products after installation and until completion of Work.

1.02 STORAGE

- A. Store products immediately on delivery and protect until installed in the Work.
 - 1. Store in accord with manufacturer's instructions, with seals and labels intact and legible.
- B. Store products subject to damage by elements in substantial weather tight enclosures.
 - 1. Maintain temperatures within ranges required by manufacturer's instructions.
 - 2. Provide humidity control for sensitive products, as required by manufacturer's instructions.
 - 3. Store unpacked products on shelves, in bins or in neat piles, accessible for inspection.
- C. Exterior Storage:
 - 1. Provide substantial platform, blocking or skids to support fabricated products above ground to prevent soiling or staining.
 - a. Cover products, subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
 - b. Prevent mixing of refuse or chemically injurious materials or liquids.
- D. Arrange storage in manner to provide easy access for inspection.

1.03 MAINTENANCE OF STORAGE

- A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:
 - 1. State of storage facilities is adequate to provide required conditions.

2. Required environmental conditions are maintained on continuing basis.
3. Surfaces of products exposed to elements are not adversely affected.
 - a. Any weathering of products, coatings and finishes is not acceptable under requirements of these Contract Documents.

B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.

1. Equipment shall not be shipped until approved by the Engineer. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the Engineer until such time as the equipment is to be installed.
3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed with the Engineer. These instructions shall be carefully followed.
5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.
6. Lubricants shall be changed upon completion of installation and as frequently as required, thereafter during the period between installation and acceptance.
7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.04 PROTECTION AFTER INSTALLATION

- A. Provide protection of installed products to prevent damage from subsequent operations. Remove when no longer needed, prior to completion of work.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Provide coverings to protect finished surfaces from damage.

PART 2 - PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01620

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the work.

1.02 SUBSTANTIAL COMPLETION

- A. The Contractor shall submit the following items when the Contractor considers the work to be substantially complete:

1. A written notice that the Work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

- B. Within a reasonable time after receipt of such notice, the Engineer and Owner shall make an inspection to determine the status of completion.

- C. Project record documents and operations and maintenance manuals must be submitted before the project shall be considered substantially complete.

- D. If the Engineer determines that the work is not substantially complete:

1. The Engineer shall notify the Contractor in writing, stating the reasons.
2. The Contractor shall remedy the deficiencies in the work and send a second written notice of substantial completion to the Engineer.
3. The Engineer shall re-inspect the Work.

- E. When the Engineer finds that the work is substantially complete:

1. He shall prepare and deliver to the Owner a tentative Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a tentative list of the items to be completed or corrected before final payment.
2. The Engineer shall consider any objections made by the Owner as provided in Conditions of the Contract. When the Engineer considers the work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion (Manatee County Project Management Form PMD-8) with a revised tentative list of items to be completed or corrected.

1.03 FINAL INSPECTION

- A. When the Contractor considered the work to be complete, he shall submit written certification stating that:
 - 1. The Contract Documents have been reviewed.
 - 2. The work has been inspected for compliance with Contract Documents.
 - 3. The work has been completed in accordance with Contract Documents.
 - 4. The equipment and systems have been tested in the presence of the Owner's representative and are operational.
 - 5. The work is completed and ready for final inspection.
- B. The Engineer shall make an inspection to verify the status of completion after receipt of such certification.
- C. If the Engineer determines that the work is incomplete or defective:
 - 1. The Engineer shall promptly notify the Contractor in writing, listing the incomplete or defective work.
 - 2. The Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to Engineer that the work is complete.
 - 3. The Engineer shall reinspect the work.
- D. Upon finding the work to be acceptable under the Contract Documents, the Engineer shall request the Contractor to make closeout submittals.
- E. For each additional inspection beyond a total of three (3) inspections for substantial and final completion due to the incompleteness of the work, the Contractor shall reimburse the Owner for the Engineer's fees.

1.04 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- A. Project Record Documents (prior to substantial completion).
- B. Operation and maintenance manuals (prior to substantial completion).
- C. Warranties and Bonds.
- D. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.
- E. Certification letter from Florida Department of Transportation and Manatee County Department of Transportation, as applicable.

- F. Certificate of Insurance for Products and Completed Operations.
- G. Final Reconciliation, Warranty Period Declaration, and Contractor's Affidavit (Manatee County Project Management Form PMD-8).

1.05 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
 1. The original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Unit Prices.
 - c. Penalties and Bonuses.
 - d. Deductions for Liquidated Damages.
 - e. Other Adjustments.
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. Project Management shall prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.06 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01700

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning during progress of the work and at completion of the Work, as required by the General Conditions.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with all Federal, State and Local codes, ordinances, regulations and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste materials, rubbish and wind-blown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- C. Prior to final completion or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire work is clean.

END OF SECTION 01710

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall maintain at the site for the Owner one record copy of:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Engineer's field orders or written instructions.
 - 6. Approved shop drawings, working drawings and samples.
 - 7. Field test records.
 - 8. Construction photographs.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI format.
- C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes
- D. Make documents and samples available at all times for inspection by the Engineer.

1.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.

- B. Record information concurrently with construction progress.
- C. Do not conceal any work until required information is recorded.
- D. Drawings; Legibly mark to record actual construction:
 - 1. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc. Locations of drainage ditches, swales, water lines and force mains shall be shown every 200 feet (measured along the centerline) or alternate lot lines, whichever is closer. Dimensions at these locations shall indicate distance from centerline of right-of-way to the facility.
 - 2. Field changes of dimension and detail.
 - 3. Changes made by Field Order or by Change Order.
 - 4. Details not on original contract drawings.
 - 5. Equipment and piping relocations.
 - 6. Locations of all valves, fire hydrants, manholes, water and sewer services, water and force main fittings, underdrain cleanouts, catch basins, junction boxes and any other structures located in the right-of-way or easement, shall be located by elevation and by station and offset based on intersection P.I.'s and centerline of right-of-way. For facilities located on private roads, the dimensioning shall be from centerline of paving or another readily visible baseline.
 - 7. Elevations shall be provided for all manhole rim and invert; junction box rim and invert; catch basin rim and invert; and baffle, weir and invert elevations in control structures. Elevations shall also be provided at the PVI's and at every other lot line or 200 feet, whichever is less, of drainage swales and ditches. Bench marks and elevation datum shall be indicated.
 - 8. Slopes for pipes and ditches shall be recalculated, based on actual field measured distances, elevations, pipe sizes, and type shown. Cross section of drainage ditches and swales shall be verified.
 - 9. Centerline of roads shall be tied to right-of-way lines. Elevation of roadway centerline shall be given at PVI's and at all intersections.
 - 10. Record drawings shall show bearings and distances for all right-of-way and easement lines, and property corners.
 - 11. Sidewalks, fences and walls, if installed at the time of initial record drawing submittal, shall be located every 200 feet or alternate lot lines, whichever is closer. Dimensions shall include distance from the right-of-way line and the back of curb and lot line or easement line.

12. Sanitary sewer mainline wyes shall be located from the downstream manhole. These dimensions shall be provided by on-site inspections or televideo of the sewer following installation.
13. Elevations shall be provided on the top of operating nuts for all water and force main valves.
14. Allowable tolerance shall be \pm 6.0 inches for horizontal dimensions. Vertical dimensions such as the difference in elevations between manhole inverts shall have an allowable tolerance of \pm 1/8 inch per 50 feet (or part thereof) of horizontal distance up to a maximum tolerance of \pm 1/2 inch.
15. Properly prepared record drawings on mylar, together with two copies, shall be certified by a design professional (Engineer and/or Surveyor registered in the State of Florida), employed by the Contractor, and submitted to the Owner/Engineer.

E. Specifications and Addenda; Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
2. Changes made by field order or by change order.

F. Shop Drawings (after final review and approval):

1. Five sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

1.05 SUBMITTAL

- A. Prior to substantial completion, deliver Record Documents and Record Drawings to the Engineer.
- B. The Contractor shall employ a Professional Engineer or Surveyor registered in the State of Florida to verify survey data and properly prepare record drawings. Record drawings shall be certified by the design professionals (Engineer and Surveyor licensed in Florida), as stipulated by the Land Development Ordinance and submitted on signed and dated mylar drawings together with 3-1/2" diskettes, AutoCad Release 12 or later for review and the use of the County in the following format:
 1. The diskettes shall contain media in AutoCad Version 12 or later, or in any other CAD program compatible with AutoCad in DWG or DXF form. Where large projects or exceptionally large files prohibit the use of diskettes, the files will be accepted on a CD ROM. All fonts, line types, shape files or other pertinent information used in the drawing and not normally included in AutoCad shall be included on the media with a text file or attached noted as to its relevance and use.

- C. All record drawing requirements must be submitted to the Engineer prior to starting the bacteria testing of water lines.
- D. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each Record Document.
 - 5. Signature of Contractor or his authorized representative.

Note: The data required to properly prepare these record drawings shall be obtained at the site, at no cost to the County by the responsible design professional or his/her duly appointed representative. The appointed representative shall be a qualified employee of the responsible design professional or a qualified inspector retained by the responsible design professional on a project-by-project basis.

PART 2 - PRODUCTS

2.01 MINIMUM RECORD DRAWING STANDARDS FOR ALL RECORD DRAWINGS SUBMITTED TO MANATEE COUNTY

- A. All valves, fire hydrants, manholes, water, reclaim water and sewer services, water and force main fittings, underdrain cleanouts, catch basins, junction boxes and any other structures located in the right-of-way or an easement, shall be located by elevation and by station and offset based on intersection PI's and centerline of right-of-way. For facilities located on private roads, the dimensioning shall be from centerline of paving or another readily visible baseline.
- B. Elevations shall be provided as listed above and for all manhole rim and invert; junction box rim and invert; catch basin rim and invert; and baffle, weir and invert elevations in control structures. Elevations shall also be provided at the PVI's and at every other lot line or 200 feet, whichever is less, of drainage swales and ditches. Bench marks and elevation datum shall be indicated.
- C. Slopes for pipe and ditches shall be recalculated, based on actual field measured distances, elevations, pipe size and type shown. Cross section of drainage ditches and swales shall be verified.
- D. Centerline of roads shall be tied to right-of-way lines. Elevation of roadway centerline shall be given at PVI's and at all intersections.

- E. Record drawings shall show bearings and distances for all right-of-way and easement lines, and property corners.
- F. Locations of drainage ditches, swales, water lines and force mains shall be shown every 200 feet (measured along the centerline) or alternate lot lines, whichever is closer. Dimensions at these locations shall indicate distance from the centerline of right-of-way to the facility.
- G. Sidewalks, fences and walls, if installed at the time of initial record drawing submittal, shall be located every 200 feet or alternate lot lines, whichever is closer. Dimensions shall include distance from the right-of-way line and the back of curb and lot line or easement line.
- H. Underdrain cleanouts for retention systems outside right-of-way shall be located by station and offset from an appropriate baseline.
- I. Sanitary sewer mainline wyes shall be located from the downstream manhole. These dimensions shall be provided by on-site inspections or televiewing of the sewer following installation.
- J. Elevations shall be provided on the top of operating nuts for water and force main valves at major intersections connecting to County and/or State roads at proposed or existing arterial highways and at drain crossings.
- K. Allowable tolerance shall be \pm 6 inches for horizontal dimensions. Vertical dimensions such as the difference in elevations between manhole inverts shall have an allowable tolerance of \pm 1/8 inch per 50 feet (or part thereof) of horizontal distance up to a maximum of \pm 1/2 inch.

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01720

SECTION 01730 - OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
 - Prepare operating and maintenance data as specified in this and as referenced in other pertinent sections of Specifications.
- B. Instruct Owner's personnel in maintenance of products and equipment and systems.
- C. Provide three (3) sets of operating and maintenance manuals for each piece of equipment provided within this Contract.

1.02 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by Owner's personnel.
- B. Format:
 - 1. Size: 8-1/2 inch x 11 inch
 - 2. Paper: 20 pound minimum, white, for typed pages
 - 3. Text: Manufacturer's printed data or neatly typewritten
 - 4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Fold larger drawings to size of text pages.
 - 5. Provide fly-leaf for each separate product or each piece of operating equipment.
 - a. Provide typed description of product and major component parts of equipment.
 - b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structures as applicable.
 - c. Identity of general subject matter covered in the manual.
- C. Binders:
 1. Commercial quality three-ring binders with durable and cleanable plastic covers.
 2. Maximum ring size: 1 inch.
 3. When multiple binders are used, correlate the data into related consistent groupings.

1.03 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit three copies of complete manual in final form.
- B. Content for each unit of equipment and system, as appropriate:
 1. Description of unit and component parts.
 - a. Function, normal operating characteristics and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Operating Procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.

3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
4. Servicing and lubricating schedule.
 - a. List of lubricants required.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. List of predicted parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
8. As installed control diagrams by controls manufacturer.
9. Each contractor's coordination drawings.
 - a. As installed color coded piping diagrams.
10. Charts of valve tag numbers, with location and function of each valve.
11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
12. Other data as required under pertinent sections of specifications.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and component parts.
 - a. Function, normal operating characteristics and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
3. As-installed color coded wiring diagrams.
4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
8. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

D. Prepare and include additional data when the need for such data becomes apparent during instruction on Owner's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.04 SUBMITTAL SCHEDULE

- A. Submit one copy of completed data in final form fifteen days prior to substantial completion.
 1. Copy will be returned after substantial completion, with comments (if any).
- B. Submit two copies of approved data in final form. Final acceptance will not be provided until the completed manual is received and approved.

1.05 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01730

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Engineer for review and transmittal to Owner.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inch x 11 inch punched sheets for standard 3-ring binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.04 TIME OF SUBMITTALS

- A. Make submittals within ten days after date of substantial completion and prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.05 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, service and maintenance contracts as specified in respective sections of Specifications.
- B. Approval by the Owner of all documents required under this section is a pre-requisite to requesting a final inspection and final payment

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

“Not Used”

END OF SECTION 01740

DIVISION 02

SITE CONSTRUCTION

SECTION 02060 – MINOR DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work includes all labor, materials, equipment, and supervision necessary to complete all demolition work including salvage, removal and disposal services required for remodeling and renovation as indicated on Drawings.

1.02 RELATED WORK

- A. ASBESTOS ABATEMENT: Section 02820.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.
- B. Remove and Salvage: If required by Owner, detach items from existing construction and deliver them to Owner ready for reuse.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.04 QUALITY ASSURANCE

- A. Qualifications of Demolition Contractor:

- 1. Demolition shall be performed only by a qualified Contractor with at least five (5) years documented experience in operations of a similar nature.

- B. Requirements of Regulatory Agencies:

- 1. Comply with governing local and state safety codes pertaining to demolition work, and the following:
 - a. ANSI A10.6 - Safety Requirements for Demolition Operations.
 - b. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - 2. Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.05 SUBMITTALS

A. Schedule:

1. Submit schedule for any temporary disconnection of electrical, telephone, security, mechanical and/or plumbing service for Owner's approval. Such disconnections shall be restricted to outside of normal operating and/or business hours with approval of Owner.

1.06 JOB CONDITIONS

A. Condition of Areas:

1. The Owner assumes no responsibility for actual condition of areas to be demolished.

B. Protection of Existing Construction:

1. Existing construction adjacent to demolition operations, and those portions designated to remain shall be given maximum protection while demolition work is in process. Damage to these portions shall be repaired or replaced at no additional cost to the Owner.

C. Salvage:

1. If indicated or otherwise required by Owner, salvageable items shall include both existing items which shall be removed and relocated to new areas or re-used in existing locations as indicated on Drawings; and salvageable items which shall be turned over to the Owner for future maintenance. In both cases, salvageable items shall remain the property of the Owner and be carefully removed from the structure as work progresses. Items to be salvaged or re-used shall be determined by Engineer and/or Owner.
2. Items to be re-used shall be stored in a safe, secure area, and be protected from damage until they are re-installed per Drawings. Items which are to be turned over to the Owner for future maintenance, shall be transported to an area designated by the Owner.
3. All salvageable items indicated on Drawings to be removed, which are not specifically scheduled for re-use, relocation, or future maintenance as designated and approved by the Authority, shall become the property of the Contractor and shall be removed from the job site and premises.

D. Protection:

1. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent structures, other facilities, and persons.
2. Erect temporary barriers and passageways as required.

E. Utility Services:

1. Existing utilities indicated to remain and to be kept in service, shall be maintained and protected against damage during demolition operations.
2. DO NOT interrupt existing utilities serving occupied or "in-use" facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing facilities, as acceptable to the Owner.

PART 2 - PRODUCTS

"Not Used"

PART 3 - EXECUTION

3.01 PREPARATION

A. Posting of Danger Signs:

1. Danger signs shall be conspicuously posted around demolition areas.

B. Access to Demolition Area:

1. With the exception of passageways and ladders for the use of workmen, access to demolition areas shall be entirely closed off at all times.

C. Temporary Shoring:

1. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
2. Strengthen or add new supports when required during progress of demolition.

3.02 PROTECTION

A. Protect existing work that is to remain in place, that is to be re-used, or that is to remain the property of the Owner, by temporary covers, shoring, bracing, and supports. Repair items damaged during performance of the work or replace with new. DO NOT overload structural elements. Provide new supports or reinforcement for existing construction weakened by demolition or removal work.

3.03 DEMOLITION

- A. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Concrete: Cut concrete full depth at junctures with construction indicated to remain, using power-driven wet saw, then remove concrete between saw cuts.
- C. Masonry: Cut masonry at junctures with construction indicated to remain, using power-driven wet saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished at junctures with construction indicated to remain using a power-driven wet saw, then break up and remove.
- E. NO materials shall be dropped (by gravity) to any point.

3.04 DUST CONTROL

- A. Use temporary enclosures, and other suitable methods to limit dust and dirt rising and scattered in air to lowest practical level.
- B. Take appropriate action to check the spread of dust and to avoid the creation of a nuisance in the surrounding area. DO NOT use water.
- C. Comply with governing regulations pertaining to environmental protection.

3.05 DISPOSAL

- A. Except for all items to be salvaged, all parts of the structures and appurtenances and all materials recovered during their demolition shall become the property of the Contractor; shall be removed from the Project by the Contractor; and disposed of off-site in a legal manner.

3.06 CLEAN-UP

- A. Clean adjacent construction and improvements of dust, dirt, and debris caused by demolition operations, to a degree acceptable to the Engineer and the Owner. Return adjacent areas to condition existing prior to start of demolition work.
- B. Keep building areas including exterior clean and free of debris at all times.

END OF SECTION 02060

SECTION 02820 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Work includes abatement and disposal of asbestos containing materials and controls required to limit occupational and environmental exposure to asbestos hazards.

1.02 RELATED WORK

- A. MINOR DEMOLITION FOR REMODELING: Section 02060.

1.03 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: The publications and standards listed below form a part of this Specification to the extent referenced herein. The publications and standards are referred to in the text by basic designation only.

1. Code of Federal Regulations (CFR)

CFR 29 Part 1910	Occupational Safety and Health Standards
CFR 29 Part 1926	Safety and health Regulations for Construction
CFR 40 Part 148	Hazardous Waste Injection Restrictions
CFR 40 Part 260	Hazardous Waste Management System; General
CFR 40 Part 261	Identification and Listing of Hazardous Waste
CFR 40 Part 262	Standards Applicable to Generators of Hazardous Waste
CFR 40 Part 263	Standards Applicable to Transporters of Hazardous Waste
CFR 40 Part 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
CFR 40 Part 268	Land Disposal Restrictions
CFR 49 Part 172	Hazardous Material Table, Special provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements
CFR 49 Part 178	Specifications for Packaging

B. Employee's (Worker's) Medical Requirements:

1. Prior to exposure to asbestos containing materials, provide workers with a comprehensive medical examination as required by 29 CFR 1926.62 (I) (1) (i) & (ii). The examination shall not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62 (I) within the last year.
2. Maintain complete and accurate medical records of employees in accordance with 29 CFR 1910.20.

C. CIH Responsibilities: The Contractor shall employ a Certified Industrial Hygienist who will be responsible for the following:

1. Certify training.
2. Review and approve asbestos containing material removal plan for conformance with the approved plan.
3. Inspect asbestos containing material removal work for conformance with the approved plan.
4. Direct monitoring.
5. Ensure work is performed in strict accordance with specifications at all times.
6. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.

D. Training:

1. Training each employee performing asbestos containing material removal, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.
2. Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

E. Respiratory Protection Program:

1. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.
2. Establish and implement a Respiratory Protection Program as required by 29 CFR 1910.134, 29 CFR 1910.1025, and 29 CFR 1926.62.

F. Hazard Communication Program:

1. Establish and implement a Hazard Communication Program required by 29 CFR 1910.1200.

G. Hazardous Waste Management:

1. The Hazardous Waste Management plan shall comply with applicable requirements of Federal, State, and local hazardous waste regulations and address:
 - a. Identification of hazardous wastes associated with the Work.

- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two (2) copies of EPA, State, and local, as applicable, permits and EPA Identification numbers.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the Work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures to be implemented.
- g. Work plan and schedule for waste disposal according to this plan.

H. Safety and Health Compliance:

1. In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities, as applicable, regarding removing, handling, storing, transporting, and disposing of asbestos containing waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1910.1025.

I. Pre-Construction Conference:

1. Along with the CIH, meet with the Engineer and Owner to discuss in detail the asbestos containing material removal work plan, including work procedures and precautions for the work plan.

1.04 SUBMITTALS

A. Manufacturer's Catalog Data:

1. Respirators.

B. Statements and Certificates:

1. Qualifications of CIH: Submit name, address, and telephone number of the CIH selected to perform responsibilities described herein. Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

C. Asbestos Containing Material Removal Plan:

1. Submit a detailed job-specific plan of the work procedures to be used in the removal of asbestos containing materials. The plan shall include a sketch showing the location, area size, and details of asbestos containing material areas. Include outline of project approach, anticipated schedule of work activities, personnel including roles and responsibilities, and methods of compliance.
2. Include in the plan, eating, drinking, smoking and restroom procedures, interface of trades, sequencing of asbestos containing material related work, collected wastewater and debris disposal plan, respirators, protective equipment, and a detailed description of the method of containment of the operation.
3. Include air sampling, training and strategy, sampling methodology, frequency, duration of sampling, and qualifications of air monitoring personnel in the air sampling portion on the plan.
 - a. Monitoring Results: Submit monitoring results to the Engineer and/or Owner within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

D. Pre-Work Submittals:

1. Prior to starting the Work, submit to the Engineer, four (4) copies of the following documents:
 - a. EPA/FDEP notification.
 - b. Current, valid Worker and Supervisor Training Certificates.
 - c. Current, valid Physician's written medical records.
 - d. Current Worker and Supervisor fit-testing records.
 - e. Insurance certificates.
 - f. MSDS for substances proposed for use on the Project.
 - g. Project Work Plan as described herein.
 - h. Details of containments system including building plan and site layout showing location of equipment including decontamination unit and critical barriers.
 - i. Certification that no non-friable materials or the substances to which they are adhered or attached will be recycled by the landfill.

E. Post Abatement Submittals:

1. Following the completion of the Work, submit to the Engineer, four (4) copies of the following documents:
 - a. Project Logs with Work area personnel access documented.
 - b. Current Training records of all personnel utilized on the Project.
 - c. Current OSHA-applicable (29 CFR 1926.1101) Statement of Physician for all personnel.
 - d. Current Fit test documentation for all utilized personnel.
 - e. Personnel Air Monitoring results.
 - f. Waste Shipment Record and Landfill Manifest Forms.
 - g. Invoice for Consultant review and forwarding to Owner.
 - h. All additional documentation as required and requested by the Owner and/or Engineer and Consultant.

1.05 DEFINITIONS

- A. Asbestos Containing Material (ACM): The term includes Chrysotile, Amosite, Crocidolite, Tremolite, and Actinolite.
- B. Certified Industrial Hygienist (CIH): As used in this Section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.
- C. Change Rooms and Showers: Rooms within the designated physical boundary around the asbestos containing material control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.
- D. Competent Person: A person capable of identifying asbestos containing material hazards in the Work area and is authorized by the Contractor to take corrective action.
- E. Decontamination Room: Room for removal of contaminated personal protective equipment (PPE).
- F. Friable Asbestos Material: Material that contains more than 1% asbestos by weight and that can be crumbled, pulverized or reduced to powder by hand pressure when dry.

G. Permissible Exposure Limit (PEL): An airborne concentrate of asbestos in excess of 1.0 fibers per cubic centimeter of air as an eight (8) hour time-weighted average (TWA), using the OSHA mandatory analytical procedure specified in 29 CFR 1926.1101, Appendix A.

PART 2 – PRODUCTS

“Not Used”

PART 3 – EXECUTION

3.01 PROTECTION

A. Notification:

1. Notify the Engineer and/or Owner fourteen (14) days prior to the start of any asbestos containing material removal work.

B. Asbestos Containing Material Control Area Requirements.

1. Establish an asbestos containing material control area by completely enclosing with containment screens the area or structure where asbestos containing material removal operations will be performed.

C. Protection of Existing Work to Remain:

1. Perform asbestos containing material removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition.

D. Boundary Requirements:

1. Provide physical boundaries around the asbestos containing material control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of asbestos will not reach outside of the asbestos containing material control area.

E. Heating, Ventilating and Air Conditioning (HVAC) Systems:

1. Shut down, lock out, and isolate HVAC systems that supply or exhaust air from area where asbestos containing materials are being removed. Seal intake and exhaust vents in the asbestos containing material removal area with 6-mil plastic sheet and tape. Coordinate with Owner for equipment shut downs.

- F. Change Room and Shower Facilities:
 - 1. Provide clean change rooms and portable showers within the physical boundary around the designated asbestos containing material removal area in accordance with requirements of 29 CFR 1926.62. Soap, shampoo, disposable towels, etc., shall be provided.
- G. Personnel Protection: Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the asbestos containing materials removal area. No one will be permitted in the asbestos containing materials removal area unless they have been given appropriate training and protective equipment.
- I. Warning Signs: Provide warning signs at approaches to asbestos containing materials removal areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.02 WORK PROCEDURES

- A. Perform removal of asbestos containing materials in accordance with approved asbestos containing materials removal plan. Use procedures and equipment required to limit occupational and environmental exposure to asbestos containing materials in accordance with 29 CFR 1926.62, except as specified herein. Dispose of removed asbestos containing materials and associated waste in compliance with Environmental Protection Agency (EPA), federal, state, and local requirements.
- B. A full three-stage decontamination unit equipped with temperature controllable water source, and HEPA equipped waste water filtering system shall be constructed immediately contiguous to the Work area.
- C. Workers shall utilize full face-powered air purifying respirators equipped with NIOSH approved HEPA cartridges throughout abatement activities, unless prior approval given by the CIH to allow a lesser respirator.
- D. All suspect asbestos-containing materials shall be wetted with amended water prior to, and during removal.
- E. Use of power tools (i.e., saws) shall not be permitted unless the equipment is equipped with HEPA filtering attachments. All power tools shall be approved by the EPA and CIH prior to use on this Project.
- F. Polyethylene sheeting of 6 mil thickness shall be placed on all exterior areas lying directly below the Work area. The sheeting shall extend a minimum of 15-feet outward from the base of the effected building (where conditions permit).

- G. Designate areas of potential hazard through the use of caution barrier tape and signage. All precautions shall be taken to protect pedestrians from falling debris and potential asbestos exposure.
- H. Full or partially filled asbestos waste bags and all debris generated during removal operations shall be removed at the termination of each work shift. Dropping or throwing waste bags from the Work area to the ground, or into receptacles staged on the ground is strictly forbidden.
- I. All waste bags shall be of 6 mil thickness and doubled, bearing proper labeling as identified previously in these specifications.
- J. All ladders, scaffolding and other fall protection equipment utilized throughout the Project shall comply with all applicable federal, State and local regulations.
- K. Personnel Exiting Procedures:
 - 1. Whenever personnel exit the asbestos containing materials removal area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:
 - a. Vacuum themselves off.
 - b. Remove protective clothing in the decontamination room, and place them in an approved impermeable disposal bag.
 - c. Shower. Shower facilities shall be constructed to such a degree as to maintain integrity throughout the asbestos containing materials removal process. Shower frames shall be constructed of sturdy metal and/or fire resistant plywood frames.
 - d. Change to clean clothes prior to leaving the physical boundary designated around the asbestos containing materials removal job site.
- L. Monitoring:
 - 1. Monitoring of airborne concentrations of asbestos containing materials shall be in accordance with 29 CFR 1910.1025 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH:
 - 1. The CIH or the IH Technician under the direction of the CIH shall be on the job site directing the monitoring, and inspecting the asbestos containing materials removal work to ensure that the requirements of the Contract have been satisfied during the entire asbestos containing materials removal operation.

2. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
3. Submit results of air monitoring samples, signed by the CIH, within twenty-four (24) hours after the air samples are taken. Notify the Engineer and/or Owner immediately of exposure to asbestos containing materials.

M. Monitoring During Asbestos Containing Materials Removal Work:

1. At least one sample on each shift shall be taken on the downwind side of the asbestos containing materials control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of asbestos containing materials contamination.

N. Clearance Testing:

1. Provide access for the Engineer to conduct visual inspection. The Engineer will conduct inspection, in accordance with applicable field inspection sections of ASTM E 1368, jointly with the Contractor's asbestos containing materials removal supervisor.
2. The Work area shall be deemed visually decontaminated by the Engineer, when no asbestos containing materials residue is observed in the Work area or on substrates from which asbestos containing materials were removed. Obtain bulk samples of suspect residue for asbestos content analysis as requested by the Engineer.

3.05 CLEANUP AND DISPOSAL

A. Cleanup:

1. Maintain surfaces of the asbestos containing materials removal control area free of accumulations of asbestos containing materials and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area.

B. Disposal:

1. "Bag-out" asbestos containing materials waste from Work area, through decontamination unit.
2. Transport all double-bagged asbestos containing materials waste, in an appropriate manner, to an appropriate landfill in a lined (6 mil plastic sheeting) vehicle.

3. Obtain properly completed EPA Waste Shipment Record and Landfill Manifest and return to the Engineer with Post-Project Submittals. Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for asbestos containing materials disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.

END OF SECTION 02820

DIVISION 05

METALS

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and install cold formed metal framing systems as indicated on the Drawings and specified herein.
- B. Types of Metal Framing Systems Include:
 - 1. Screw-type drywall metal studs, including furring and ceiling support members.
 - 2. Structural C type shaped steel studs.

1.02 RELATED WORK

- A. GYPSUM WALLBOARD: Section 09250.
- B. TOILET ROOM ACCESSORIES: Section 10800.
- C. STEEL LABORATORY CASEWORK: Section 12345.

1.03 QUALITY ASSURANCE

- A. Design Criteria: The Architect has shown design conditions and effects required, however; arrangement, bracing, hanging, and support method for metal framing systems shall be the responsibility of the Contractor and the Contractor's Installer.
- B. Component Design: Compute structural properties of studs and joists in accordance with AISC "Specification for the Design of Cold-Formed Steel Structural Members".
- C. Reference Standards: Comply with referenced standards of the following, unless otherwise indicated or specified:
 - 1. American Galvanizers Association (AGA).
 - 2. American Institute of Steel Construction (AISC).
 - 3. American Society for Testing and Materials (ASTM).
 - 4. American Welding Society (AWS).

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for each material.

1.05 PRODUCT DELIVERY AND STORAGE

A. Upon delivery to the site, store materials in their original unopened packages in an enclosed shelter providing protection from damage from exposure to the elements. Damaged or deteriorated materials shall be removed from the site and replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products: For each of the metal framing types listed herein, provide products by one of the following manufacturers:

1. Screw-Type Drywall Metal Studs and Ceiling Support Members:
 - a. Dale Industries, Inc.
 - b. Dietrich Metal Framing.
 - c. National Gypsum Co.
 - d. Unimast, Inc.
2. Structural C Type Shaped Steel Studs:
 - a. Alabama Metal Industries Corp.
 - b. Dale/Incor Industries of Florida.
 - c. Marino Ware Div. of Ware Industries, Inc.
 - d. Unimast, Inc.

2.02 SYSTEM COMPONENTS

A. With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoe reinforcements, fasteners and accessories as recommended by manufacturer for application indicated, and/or as needed to provide a complete metal framing system.

2.03 MATERIALS AND FINISHES

A. Screw-Type Drywall Metal Studs, Ceiling Support Members, and Accessories:

1. Metal Studs: ASTM C 645, 25 gauge minimum thickness of hot-dipped galvanized base metal, complying with ASTM A 653, G40 for zinc coating. Use 20 gauge where limited heights and loading (i.e. ceramic tile, cabinets) as recommended by stud manufacturer are exceeded.
 - a. Depth of Section: As indicated.
 - b. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

2. Furring Members: Comply with the following:
 - a. ASTM C 645; 25 gauge minimum thickness of base metal, hat shaped. 7/8 inch depth for wall furring members.
 - b. Fasteners for Furring Members: Type and size recommended by furring manufacturer for the substrate and application required.
3. Screw-Type Ceiling Support Members: Comply with the following:
 - a. Furring Channels: ASTM C 645; 25 gauge minimum thickness of hot-dip galvanized base metal, hat shaped, complying with ASTM A 653, G40 for zinc coating.
 - b. Runner Channels: 16 gauge minimum thickness of hot-dip galvanized base metal, 1-1/2 inches channel depth.
 - c. Hanger and Tie Wire: 9 gauge minimum for hanger and 18 gage minimum for tie.
4. Screws shall be corrosion-resistant steel, self-drilling and tapping type, with cross-recessed heads, 3/8 inch low-profile head.

B. Structural C Type Shaped Steel Studs:

1. For 16 gauge and heavier units, fabricate metal framing components of structural quality hot-dip galvanized steel sheet complying with ASTM A 653, Grade 40, G60 zinc coating.
2. For 18 gauge and lighter units, fabricate metal framing components of commercial quality hot-dip galvanized steel sheet complying with ASTM A 653, Grade 33, G60 zinc coating.
3. "C"-Shape Studs: Manufacturer's standard load-bearing steel studs of size, shape and gauge indicated, with 1.625 inches minimum flange and flange return lip.

C. Framing Accessories: Fabricate steel framing accessories of the same material, finish, and yield stress used for framing members.

D. Galvanizing Repair Paint: ASTM A 780.

2.04 PREFABRICATION OF STRUCTURAL STUDS

A. General: Structural framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, and true to line.

B. Fasten framing components by welding only, unless noted otherwise. Comply with AWS D1.3 requirements and procedures for welding appearance and quality of welds, and methods used in correcting welding work.

- C. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which cold formed metal framing shall be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. All partitions and framing shall be aligned accurately as shown on Drawings. All runners shall be securely attached to concrete slabs, metal joists or beams with power driven anchors or other suitable fasteners in accordance with manufacturer's published instructions and current recommendations, unless otherwise indicated.
- B. Floor runner-tracks shall be set in full bed of sealant. Ceiling and floor tracks shall be anchored at 24 inch centers and positioned to insure vertical alignment of partitions. Studs of proper length shall be placed in tracks and rotated into place for a friction fit and secured on both tracks with screws. Double studs shall be provided at all openings.
- C. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures equipment, services, casework, heavy trim and furnishings and similar work.
- D. Wood blocking or plates shall be securely installed as required for equipment or other material support.
- E. A minimum of 3 studs shall be installed at all partition intersections. Studs located at partition intersections shall be secured with screws through both flanges of studs and tracks. Headers for openings shall be a cut-to-length section of track with the flanges slit and web bent to allow flanges to overlap adjacent studs.
- F. Install miscellaneous framing and connections to provide a complete and stable wall framing system.
- G. For structural studs, attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.
- H. Wire tying of framing components shall not be permitted, except where indicated for suspended drywall ceilings.

3.03 REPAIRS

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 05400

DIVISION 06

**WOOD, PLASTICS AND
COMPOSITES**

SECTION 06100 – ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Wood furring, grounds, nailers, and blocking.
 - 2. Sheathing.

1.02 RELATED WORK

- A. COLD-FORMED METAL FRAMING: Section 05400.
- B. INTERIOR ARCHITECTURAL WOODWORK: Section 06402.
- C. GYPSUM WALLBOARD: Section 09250.
- D. TOILET ROOM ACCESSORIES: Section 10800.
- E. STEEL LABORATORY CASEWORK: Section 12345.

1.03 SUBMITTALS

- A. Wood Treatment Data: As follows, including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated materials:
 - 1. For each type of preservative treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holder capacities of treated materials.
- B. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
- C. Warranty: Of chemical treatment manufacturer for each type of treatment.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- B. Single Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of engineered wood product from one source and by a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

2.01 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- C. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sized for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2 inch nominal thickness or less, unless otherwise indicated.

2.02 WOOD PRESERVATIVE TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated wood or is specified to be treated, comply with applicable requirements of AWPA C2 (Lumber) and AWPA C9 (Plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 1. Do not use chemicals containing chromium or arsenic.
 - 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing and flashing.
 - 2. Wood blocking, furring, and similar concealed members in contact with masonry or concrete.

- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- D. Preservative Treatment Products: One of the following:
 - 1. "Wolman CCA Type C"; Arch Wood Protection, Inc.
 - 2. "CCA"; Hoover Treated Products, Inc.
 - 3. "Osmose CCA-C"; Osmose, Inc.

2.03 FIRE-RETARDANT TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
 - 1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
 - 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 - 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
- D. Fire Retardant Treatment Products: One of the following:
 - 1. "Dricon FRT"; Arch Wood Protection, Inc.
 - 2. "Pyro-Guard"; Hoover Treated Wood Products, Inc.
 - 3. "FirePro FRTW"; Osmose, Inc.

2.04 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide Standard grade lumber per ALSC's NGRs of any species. for board-size lumber, provide No. 2 grade per SPIB; or Standard grade per WCLIB or WWPA of any species.

2.05 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

- A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2 "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1 "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Structural-Use Panel Standard: Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."
- C. Trademark: Factory-mark structural-use panels with APA trademark evidencing compliance with grade requirements.
 - 1. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30 "APA Design/Construction Guide: Residential & Commercial."

2.06 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
 - 1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 - 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30 "APA Design/Construction Guide: Residential & Commercial."

- B. Roof Sheathing: APA-rated sheathing.
 - 1. Exposure Durability Classification: Exposure 1.
 - 2. Span Rating: 48/24 or Roof - 48.

2.07 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.08 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the Florida Building Code.

- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- G. Use hot-dip galvanized or stainless steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.02 WOOD GROUNDS, NAILERS, AND BLOCKING

- A. Install wood grounds, nailers, and blocking where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work.
- C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.
- B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal size furring at 16 inches o.c., vertically.

3.04 INSTALLATION OF STRUCTURAL-USE PANELS

- A. General: Comply with applicable recommendations contained in APA Form No. E30 "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 1. Comply with "Code Plus" provisions of above-referenced guide.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Sheathing: Nail to framing. Space panels 1/8 inch at edges and ends.
 2. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 06100

SECTION 06402 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Plastic laminate cabinets.
 - 3. Plastic laminate counter tops.
 - 4. Shop finishing of woodwork.

1.02 RELATED WORK

- A. ROUGH CARPENTRY: Section 06100. For wood furring, blocking, shims, and hanging strips for installing woodwork and concealed within other construction before woodwork installation.
- B. JOINT SEALANTS: Section 07920.
- C. FLUSH WOOD DOORS: Section 08211.
- D. FINISH HARDWARE: Section 08710.
- E. GYPSUM WALLBOARD: Section 09250.
- F. PAINTING: Section 09900. For field finishing of interior architectural woodwork.
- G. TOILET PARTITIONS: Section 10160.
- H. FIRE PROTECTION SPECIALTIES: Section 10520.
- I. TOILET ROOM ACCESSORIES: Section 10800.
- J. STEEL LABORATORY CASEWORK: Section 12345.

1.03 SUBMITTALS

- A. Product Data: For each type of product, including cabinet hardware and accessories, and finishing materials and processes.
- B. Shop Drawings: Showing location of each item, dimensioned plans and elevations, large scale details, attachment devices, and other components.
 - 1. Show details full size.

2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Verification: For the following:

1. Lumber with or for transparent finish, 50 sq. in., for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
3. Plastic-laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
4. Exposed cabinet hardware and accessories, one unit of each type and finish.
5. 1/2 pint sample of specified wood stain. Refer to Section 09001 - FINISH AND MATERIAL SCHEDULE.

D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with specified requirements.

E. Qualification Data: For firms and persons specified in "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.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork 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. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that required for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork with sequence-matched wood veneers.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1. Provide AWI Certification Labels or compliance certificate indicating that woodwork complies with requirements of grades specified.

E. Pre-Installation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions".

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on shop drawings.

1.07 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08710 - FINISH HARDWARE to fabricator of architectural woodwork; coordinate shop drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

- B. Wood Species and Cut for Transparent Finish: Clear white maple (stained).
- C. Wood Species for Opaque Finish: Any closed-grain hardwood.
- D. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
 - 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 4. Softwood Plywood: PS 1, Medium Density Overlay.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- E. Clear Float Glass for Doors: ASTM C 1036, Type I, Class 1, Quality q3, 6 mm thick, unless otherwise indicated.
- F. Tinted Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 2, Quality q3; manufactured by horizontal (roller hearth) process, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated. "Blue" tint.
- G. Laminated Glass for Display Case: ASTM C 1172, with polyvinyl butyral interlayer. 2 inch beveled edges. 9/16 inch total thickness. Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets. Provide key-operated jewelry cabinet lock hardware.
- H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Formica Corporation.
 - b. Laminart.
 - c. Pioneer Plastics Corp.
 - d. Westinghouse Electric Corp.; Specialty Products Div.
 - e. Wilsonart International; Div. of Premark International, Inc.
- I. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.02 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets., except for items specified in Section 08710 "Finish Hardware."
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Frameless, Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- D. Wire Pulls: Back mounted, 4 inches long, 5/16 inches in diameter.
- E. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Shelf Rests: BHMA A156.9, B04013.
- H. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Box Drawer Slides: 100 lbf.
 - 2. File Drawer Slides: 200 lbf.
 - 3. Pencil Drawer Slides: 45 lbf.
 - 4. Keyboard Slide: 75 lbf.
- I. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- J. Door Locks: BHMA A156.11, E07121.
- K. Drawer Locks: BHMA A156.11, E07041.
- L. Grommets for Cable Passage through Countertops: 2-inch OD, brown, molded-plastic grommets and matching plastic caps with slot for wire passage.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.03 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.04 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content in relation to ambient relative humidity conditions during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles and details indicated.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on shop drawings before disassembling for shipment.
- F. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- G. Install glass to comply with applicable requirements in Section 08800 - GLASS AND GLAZING. For glass in wood frames, secure glass with removable stops.

2.05 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 300.
- B. Grade: Premium.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation required field assembly.
- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- H. Wood Species and Cut: White oak, rift sawn.

2.06 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Quality Standard: Comply with AWI Section 300.
- B. Grade: Premium.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- D. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- F. Wood Species: Any closed-grain hardwood.

2.07 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate clad cabinets.
- B. Grade: Premium.

- C. AWI Type of Cabinet Construction: As indicated.
- D. Laminate Cladding for Exposed Surfaces: High pressure decorative laminate, complying with the following requirements.
 - 1. Horizontal Surfaces Other Than Tops: HGS.
 - 2. Postformed Surfaces: HGP.
 - 3. Vertical Surfaces: HGS.
 - 4. Edges: HGS.
- E. Materials for Semi-Exposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other than Drawer Bodies: High pressure decorative laminate, Grade CLS.
 - 2. Drawer Sides and Backs: Solid hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- F. Colors, Patterns, and Finishes: Refer to Drawings.
- G. Provide dust panels of 1/4 inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.08 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.
- B. Grade: Premium.
- C. Colors, Patterns, and Finishes: Refer to Drawings.
- D. Edge Treatment: Lumber edge for transparent finish matching wood species and cut on wood cabinet surfaces.
- E. Core Material: Exterior-grade plywood.

2.09 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General: Shop finish transparent finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Section 09900 - PAINTING for finishing opaque finished architectural woodwork.

- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
- D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60 degree gloss meter per ASTM D 523.
 - 1. Grade: Premium.
 - 2. AWI Finish System: TR-6: Catalyzed polyurethane.
 - 3. Staining: Custom stain.
 - 4. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
 - a. Apply vinyl wash coat sealer after staining and before filling.
 - 5. Sheen: Stain, 30-50 gloss units.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Calk space between backsplash and wall with sealant specified in Section 07920 - JOINT SEALANTS.

- H. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.
- I. Refer to Section 09900 - PAINTING for final finishing of installed opaque-finished architectural woodwork.

3.03 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

DIVISION 07

**THERMAL AND
MOISTURE PROTECTION**

SECTION 07210 – BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Types of insulation included under this Work shall include, but not be limited to:
 - 1. Faced Mineral Fiber Blanket/Batt Insulation.
 - 2. Safing Insulation.
 - 3. Sound Attenuation Blankets.

1.02 RELATED WORK

- A. COLD FORMED METAL FRAMING: Section 05400.
- B. FIRESTOPPING: Section 07270.
- C. GYPSUM WALLBOARD: Section 09250.

1.03 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Verification: Representative samples for each type of insulation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the Project site in original unopened packages, clearly marked with product brand name and manufacturer's labels. Store under cover and protect from weather and construction activities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft or foil-scrim polyethylene vapor-retarder on one face, and as follows:
 - 1. Mineral Fiber Type: Fibers manufactured from glass.
 - 2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
 - 3. Flanged Units: Provide blankets/batts fabricated with facing incorporating 4-inch wide flanges along the edges for attachment to framing members.

4. Products: Provide insulation products by one of the following manufacturers:
 - a. CertainTeed Corporation.
 - b. Johns Manville Corporation.
 - c. Owens Corning.
5. Thickness: As indicated on the Drawings.

B. Safing Insulation: UL Rated semi-rigid boards designed for use as a fire stop at top of rated walls and openings, for ratings indicated, ASTM C 612, Class 1 and 2, nominal density of 4.0 lbs. per cu. ft., passing ASTM E 136 for combustion characteristics.

1. Refer to Section 07270 - FIRESTOPPING for additional requirements.
2. Products: Provide "Thermafiber" safing insulation with "Thermafiber Smoke Seal" compound for firestopping and smokestopping as manufactured by United States Gypsum Company.

C. Sound Attenuation Blankets: ASTM C 665, Type I, Class 25 flame spread, thickness as indicated or as required by STC Assembly Rating.

1. Products for Non-Rated Applications: Provide one of the following products:
 - a. "CertaSound Sound Attenuation Batts"; CertainTeed Corp.
 - b. "Sound Attenuation Batt Insulation"; Owens Corning.
 - c. "Sound-Shield"; Johns Manville Corporation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install building insulation in strict compliance with manufacturer's written instructions.

END OF SECTION 07210

SECTION 07270 – FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the firestopping of all penetrations through fire-rated floors, walls, and ceilings as indicated on Drawings and herein specified.
- B. Definitions:
 - 1. Fire Barrier: Any floor, wall, or ceiling which is indicated as having a fire-resistance rating.
 - 2. Firestopping: Materials or devices used to seal openings that have been made in fire-rated floors, walls, and/or ceilings for the purposes of passing building service penetrations such as electrical conduits, electrical, data or communications cabling, plumbing or mechanical pipes, HVAC or mechanical ducting of any type.

1.02 RELATED WORK

- A. COLD FORMED METAL FRAMING: Section 05400.
- B. BUILDING INSULATION: Section 07210.
- C. GYPSUM WALLBOARD: Section 09250.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:
 - 1. Underwriters Laboratories Inc. (UL):
 - a. Building Materials Directory, latest edition.
 - b. Fire Resistance Directory, latest edition.
 - c. UL1479 - Fire Tests of Through-Penetration Firestops.
 - 2. Factory Mutual Global (FMG):
 - a. FMS P7825 Approval Guide; Factory Mutual System.
 - 3. American Society for Testing and Materials (ASTM):
 - a. ASTM E 814 Test Method of Fire Tests of Through-Penetration Fire Stops.
 - b. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.

B. Testing Requirements: All materials shall be tested as firestop systems in accordance with ASTM E 814 (UL1479) or equivalent. System designs shall provide a fire-resistance rating equal to or exceeding the fire-resistance rating of the floor, wall, or ceiling assembly in which it is being installed. Testing shall have been conducted or witnessed by an independent testing agency acceptable to the authorities having jurisdiction.

C. Environmental and In Service Requirements:

1. All materials to be used as components of the specified firestop systems shall be suitable for use in the specified environment, and to the expected service conditions of the installation.
2. Environmental Conditions: The following conditions shall be considered in selection of appropriate materials for environmental conditions:
 - a. Water Sealing: Openings requiring water sealing (such as openings through exterior walls or below grade subject to hydrostatic pressure) shall be sealed using appropriate waterproofing methods and materials subject to Engineer's approval. FIRESTOPPING SHALL BE INDEPENDENT AND IN ADDITION TO THIS FUNCTION.
 - b. Water-Resistance: All firestopping materials and firestop designs shall be water-resistant and shall be insoluble in water when dried or cured (where said drying and/or curing is required for firestop functionally). All firestopping materials shall be capable of maintaining functionality under conditions of high humidity or transient exposure to water.
 - c. Ambient Installation Temperatures: Firestop materials supplied shall be capable of being installed under prevailing temperature conditions unless provisions have been made to heat or cool the area of installation as required.
3. In-Service Conditions: The following conditions shall apply in the selection of materials and designs for firestopping.
 - a. Ampacity Derating: Materials and system designs shall not require ampacity derating in power cable installations.
 - b. Materials Compatibility: Materials shall be compatible with all materials used in the system including materials used in or on penetrants, as well as all construction materials used in conjunction with the system. No solvent based materials shall be used unless specific test documentation is provided certifying compatibility with all contact materials.

- c. Flammability and Outgassing: All materials shall pose no particular fire hazard in storage, installation, cure or under in-service conditions.
- d. Installations Subject to Movement of Penetrants: Openings with penetrants subject to movement or vibration shall be sealed with products and systems designed to accommodate such movement without reduction or loss of functionality.
- e. Installations Subject to Frequent Retrofit: Materials and designs provided for through-penetrations where changes of penetrations will be made on a frequent basis, shall be capable of retrofit without damage to the system.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for each manufactured product.
- B. Certification: Submit evidence of UL Classification, FMG Approval, or equivalent third party testing. Submit certificate that such listings are current and subject to follow-up service inspection by listing body.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of products to minimize storage time at Project site.
- B. Deliver products to Project site in original unopened containers bearing the name of the manufacturer, product name, type, and testing agency's identification mark.
- C. Store products in accordance with manufacturer's published instructions and provide protection from damage and exposure to the elements. All materials shall be stored in locations providing the temperature conditions as detailed by the manufacturer's written instructions. All damaged or deteriorated materials shall be removed from the Project site.

1.06 PROJECT CONDITIONS

- A. Sequencing/Scheduling: Perform firestopping work after completion of work which penetrates fire barriers, but prior to covering up or eliminating access to the penetration. Coordinate with installers of such other work.
- B. Protection: Protect installed work during and after curing period, and damage from construction operations using substantial barriers if necessary. Repair damaged materials in accordance with manufacturer's published instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: One of the following manufacturers:

1. International Protective Coatings Corporation.
2. 3M Fire Protection Products.
3. Bio Fireshield Div., Rectorseal Corporation.
4. Specified Technologies, Inc.

B. DO NOT substitute for products required by the tested assembly.

2.02 FIRESTOPPING MATERIALS

A. Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.

B. Use the materials required for the tested assemblies indicated on the schedule. Where no tested assembly is indicated for a particular penetration, use any tested assembly which complies with the requirements of the specifications.

C. Provide products which:

1. Allow normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
2. Emit no hazardous, combustible, or irritating by-products during installing or curing period.
3. Do not require special tools for installation.

D. Labels:

1. Red, permanent marking using the words "FIRE-RATED ASSEMBLY - DO NOT DISTURB - SEE MAINTENANCE INSTRUCTIONS" or equivalent as approved by the authorities having jurisdiction.

2. For marking fire barriers, use wording "FIRE BARRIER - PROTECT ALL OPENINGS" in a manner acceptable to the authorities having jurisdiction.

C. NO ASBESTOS CONTAINING MATERIALS SHALL BE USED ON THIS PROJECT.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Pre-Installation Inspection: Comply with the following:
 - 1. Inspect all fire barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping. Conduct inspection prior to covering up or enclosing walls or ceilings.
 - 2. If the configuration of a particular penetration does not conform to the configuration to suit the assembly; do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authorities having jurisdiction.

3.02 PREPARATION

- A. Prepare penetration in accordance with the material manufacturer's published instructions.
- B. All contact surfaces including penetrants and construction surfaces, shall be free of loose dirt, scale, rust, and oil.
- C. Power to exposed cables shall be shut off, all cable jacketing inspected, and any damage shall be reported to the Electrical Installer and repaired by same before proceeding.
- D. Provide drop cloths or other protection as needed to protect surrounding areas.

3.03 INSTALLATION

- A. Install penetration seals pursuant to design requirements in strict accordance with manufacturer's published instructions.
- B. Inspect installation including sealant materials and any damming or support materials to verify integrity of installation. Where system design permits, remove damming or support materials only after it has been determined that sealant materials have fully cured or dried.
- C. Install any covering materials or finish pursuant to design requirements and manufacturer's published instructions.

3.04 PERMANENT IDENTIFICATION OF PENETRATIONS

- A. Mark each fire barrier above lay-in ceilings with words identifying it as a fire barrier at intervals required by authorities having jurisdiction, but not less than 20-feet pursuant to Article 2.02, Paragraph B., herein.

3.05 REPAIRS AND MODIFICATIONS

- A. Identify damaged and/or improperly installed seals for repair or modification.
- B. Modifications to penetrants shall be in accordance with the firestopping material manufacturer's current recommendations.
- C. Only materials used in the original seal and designated by the manufacturer as suitable for said repair, shall be used for this purpose.

3.06 FIELD QUALITY CONTROL

- A. All seals shall be inspected for proper installation, drying, curing, adhesion as appropriate for the materials and systems being used. Where necessary, repairs shall be made and repaired installations shall be reinspected.
- B. Access to work areas shall remain in place until designated inspector is notified that installation has been completed and is ready for inspection as required.
- C. Obtain the services of firestopping material manufacturer's representative to instruct installers and to inspect the completed installations for correctness.

3.07 CLEANING

- A. Clean up excess material adjacent to penetrations sealed as work progresses by methods and with cleaning materials approved by the manufacturers of the materials and of products to be cleaned.

END OF SECTION 07270

SECTION 07920 – JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing and installation of joint sealants as indicated on the Drawings and as specified herein.

1.02 RELATED WORK

- A. FIRESTOPPING: Section 07270.
- B. INTERIOR ALUMINUM DOOR FRAMES: Section 08125.
- C. GLASS AND GLAZING: Section 08800.
- D. GYPSUM WALLBOARD: Section 09250.
- E. PAINTING: Section 09900.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall have a minimum of five (5) years continuous documented experience in the application of the types of materials required.

1.04 PRODUCT DELIVERY AND STORAGE

- A. All products shall be delivered to the site undamaged, and in the manufacturer's original packing. Products shall be stored within the manufacturer's published temperature tolerances.

1.05 SUBMITTALS

- A. Product Data: Submit complete instructions for handling, storage, mixing, priming, installation, curing, and protection of each type of sealant.
- B. Samples: Submit the following samples:
 1. One tube, in original sealed container, of sealant specified.
 2. One foot of each joint filler specified.
 3. Color chart.
- C. Installer's Qualification: Submit documented evidence of installer's qualifications.

1.06 ENVIRONMENTAL CONDITIONS

- A. Do not install materials when the temperature is below 40 degrees F, unless the manufacturer specifically recommends application of his materials at lower temperatures. If job progress or any other condition requires installations when temperatures are below 40 degrees F (or below the minimum installation temperature recommended by the manufacturer), consult the manufacturer's representative and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with a copy to the Engineer, the conditions under which such installation must proceed, and the provisions made to ensure satisfactory work.
- B. Do not proceed with installation of bulk compounds during inclement weather unless all requirements and manufacturer's instructions can be complied with. Do not proceed with the installation of elastomeric sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width, or when such extreme temperatures or heavy wind loads are forecast during the period required for initial or nominal cure of elastomeric sealants. Whenever possible, schedule the installation and cure of elastomeric sealants during periods of mean temperatures (nominal joint width shown) so that subsequent stresses upon the cured sealants will be minimized.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Hardnesses shown and specified are intended to indicate the general range necessary for overall performance. The manufacturer's technical representative shall determine the actual hardness recommended for the conditions of installation and use. Except as otherwise indicated or recommended, compounds shall be provided within the range of hardness (Shore A, Fully cured, at 75 degrees F) of 25 to 40.
- B. The Contractor shall confirm its compatibility with the joint surfaces, joint fillers, and other materials in the joint system. Only materials which are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification, shall be provided.

2.02 EXTERIOR SEALANTS

- A. Sealants for exterior locations and all interior and exterior expansion joints shall be cold-applied elastomeric joint sealant, two-part polyurethane sealant meeting Federal Specification (FS) TT-S-00227E and ASTM C 920.

B. Products, Horizontal Joints: Provide one of the following Type M, Grade P sealants:

1. "Urexpan NR-200"; Pecora Corp.
2. "Vulkem 227"; Tremco Inc.
3. "Sonolastic SL 2"; Sonneborn Building Products, Div. Of Chemrex, Inc.

C. Products, Vertical Joints: Provide one of the following Type M, Grade NS sealants:

1. "Dynatrol II"; Pecora Corp.
2. "Vulkem 227"; Tremco Inc.
3. "Sonolastic NP 2"; Sonneborn Building Products, Div. of Chemrex, Inc.

2.03 INTERIOR SEALANTS

A. Sealants for interior locations shall be acrylic latex sealant compound, non-staining, non-bleeding, paintable, complying with ASTM C 834. Provide one of the following sealants:

1. "Pecora AC-20"; Pecora Corp.
2. "Sonolac"; Sonneborn Building Products, Div. Of Chemrex, Inc.
3. "Tremflex 831"; Tremco Inc.

B. Acoustical Joint Sealants: Sealants for interior acoustical applications shall be nonsag, paintable, nonstaining latex sealant complying with ASTM C 834.

1. Products, Exposed Joints: Provide one of the following sealants:
 - a. "AC-20 FTR Acoustical and Insulation Sealant"; Pecora Corp.
 - b. "Sheetrock Acoustical Sealant"; USG Corp.
2. Products, Concealed Joints: Provide one of the following sealants:
 - a. "BA-98"; Pecora Corp.
 - b. "Tremco Acoustical Sealant"; Tremco Inc.

C. Fire Stop Sealant: Fire stop sealant used to seal penetrations in fire rated partitions shall be a silicone-based sealant. Provide one of the following sealants:

1. "Firestop Sealant 2000 Plus"; 3M Corp.
2. "Pensil 100 Firestop Sealant"; Specified Technologies, Inc.

2.04 MISCELLANEOUS MATERIALS

- A. Joint cleaner shall be "Xylol", or any other type of compound recommended by the sealant compound manufacturer, for the joint surfaces to be cleaned.
- B. Bond breaker tape shall be polyethylene tape, or other plastic tape, as recommended by the sealant manufacturer, to be applied to sealant contact surfaces where bond to the substrate or joint filler must be avoided for the proper performance of sealant. Self-adhesive tape shall be used wherever applicable.
- C. Backer rods shall be closed-cell, expanded polyethylene. The size and shape of the rod shall be that which will control the joint, form optimum shape of sealant bead on the back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when the joint is compressed.

2.05 COLORS

- A. For concealed joints, provide manufacturer's standard color which has the best overall performance qualities for the application shown. For exposed joints, the Engineer will select colors from the manufacturer's standard or non-standard colors.

PART 3 - EXECUTION

3.01 INSPECTION

- A. The sealant installer shall examine the areas and conditions under which the sealants are to be installed, and notify the Contractor in writing (with a copy to the Engineer) of any conditions detrimental to this phase of the work, and shall not proceed until the unsatisfactory conditions have been corrected. Commencement will be construed as acceptance of the conditions.

3.02 SURFACE PREPARATION

- A. Sealant material shall be applied before any adjacent coating or painting is applied; otherwise, the laboratory test for durability specified in the following paragraph (B.) shall be required.
- B. Installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating, shall not proceed unless a laboratory test for durability (adhesion), in compliance with Paragraph 4.3.9 of FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the particular coating or treatment. If laboratory test has not been performed, or if test results indicate bond interference, the coating or treatment shall be removed from joint surfaces before installing sealant.
- C. Concrete and masonry joint surfaces shall be etched to remove excess alkalinity with dilute muriatic acid solution, and then sprayed with water and allowed to dry before installation, unless the sealant manufacturer's published instructions indicate that alkalinity does not interfere with sealant bond.

3.03 INSTALLATION

- A. Comply with the sealant manufacturer's published instructions, except where more stringent requirements are shown or specified, and except where the manufacturer's technical representative recommends otherwise.
 - 1. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. The joint surfaces shall be primed or sealed wherever shown or recommended by the sealant manufacturer. Primer/sealer shall not be spilled or allowed to migrate onto adjoining surfaces.
- C. Sealant backer rod shall be installed for elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- D. Bond breaker tape shall be installed wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly, or as detailed on the Drawings.
- E. Only proven installation techniques shall be employed which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, sealant joints shall be filled to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, joints shall be filled to form a slight cove, so that the joint will not trap moisture and dirt.
- F. Sealants shall be installed to depths as shown, or if not shown, as recommended by the sealant manufacturer, but within the following general limitations measured at the center (thin) section of the bead.
 - 1. For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposure, joints shall be filled to a depth equal to 75 percent of the joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
 - 2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, joints shall be filled to a depth equal to 50 percent of joint width, but not more than 3/8 inch nor less than 1/4 inch.
 - 3. For joints sealed with non-elastomeric sealant compounds, joints shall be filled to a depth in the range of 75 percent to 115 percent of the joint width.
- G. Sealant compounds shall not be overflowed or spilled onto adjoining surfaces, or allowed to migrate into the voids of adjoining surfaces including rough textures. Masking tape or other precautionary devices shall be used to prevent staining of adjoining surfaces by either the primer, sealer and/or the sealant compound.

- H. Any excess or spillage of compounds shall be removed promptly as the work progresses. Adjoining surfaces shall be cleaned by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes.
- I. Do not plug weep holes (if occurring) built into aluminum framing.

3.04 CURE AND PROTECTION

- A. Sealant compounds shall be cured in compliance with the manufacturer's published instructions and current recommendations to obtain high early bond strength, internal cohesive strength, and surface durability.
- B. The installer shall advise the Contractor of procedures required for the curing and protection of sealants compounds during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering), at the time of Final Acceptance.

END OF SECTION 07920

DIVISION 08

OPENINGS

SECTION 08125 – INTERIOR ALUMINUM DOOR FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section includes interior aluminum door frames.

1.02 RELATED WORK

- A. FLUSH WOOD DOORS: Section 08211.
- B. FINISH HARDWARE: Section 08710.

1.03 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Qualification Data: For Installer.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of performing work of this Section and who is acceptable to manufacturer.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on shop drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: RACO.

2.02 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.

2.03 DOOR FRAMES

- A. Manufacturer's standard extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - 2. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

2.04 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum door frames, as specified in Section 07920 - JOINT SEALANTS.
- B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.05 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Frame Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformation.
 - 2. Accurately fitted joints with ends coped or mitered.
- C. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware:
 - 1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

2.06 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Finish: Polymer resin based powder coating system. 1.2 mils coating thickness. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating manufacturer's written instructions.
 - 1. Basis of Design: Match "Midnight Blue" Interpon D2000 Advanced Powder Coating by Kawneer Company, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
- C. Install components plumb and true in alignment with established lines and grades, without warp or rack.

END OF SECTION 08125

SECTION 08211 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. NOTE – An inventory of Flush Wood Doors exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Flush Wood Doors to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Flush Wood Doors used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Flush Wood Doors is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. INTERIOR ARCHITECTURAL WOODWORK: Section 06402.
- C. INTERIOR ALUMINUM DOOR FRAMES: Section 08125.
- D. FINISH HARDWARE: Section 08710.
- E. GLASS AND GLAZING: Section 08800.
- F. FINISH AND MATERIAL SCHEDULE: Section 09001.

1.03 SUBMITTALS

- A. Schedule of Flush Wood Doors: Submit schedule of all Flush Wood Doors including a breakdown of doors supplied from Owner's existing inventory.

- B. Product Data: For each type of door. Include details of core and edge construction and trim for openings.
- 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 ratings for fire doors.
- D. Samples for Verification: Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on shop drawings.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time after date of Substantial Completion:
 - a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:
 - 1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Buell Door Co.
 - c. Eggers Industries.
 - d. Marshfield Door Systems.

2.02 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
 - 1. Grade: Premium (Grade A faces).
 - 2. Species and Cut: Clear white maple, rotary cut.
 - 3. Stain to match requirements in Section 06402 - INTERIOR ARCHITECTURAL WOODWORK and Section 09001 - FINISH AND MATERIAL SCHEDULE.
- B. Stiles: Same species as faces.

2.03 SOLID CORE DOORS

- A. Interior Veneer-Faced Doors:
 - 1. Core: Glued-block.
 - 2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
 - 3. Construction: Seven plies, either bonded or nonbonded construction.
- B. Fire-Rated Doors:
 - 1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
 - 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability for use in doors of fire ratings indicated as follows:
 - a. 5 inch top rail blocking.
 - b. 5 inch bottom rail blocking, in doors indicated to have protection plates.
 - c. 5 inch midrail blocking, in doors indicated to have armor plates.
 - d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
 - 3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance with outer stile matching face veneer.

2.04 LIGHT FRAMES

- A. Wood Frames for Light Openings in Wood Doors:
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Flush rectangular beads.
 - 3. At 20-minute, fire rated, wood core doors, provide wood beads and metal glazing clips approved for such use.
- B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478 inch thick, cold-rolled steel sheet, factory primed and approved for use in doors of fire-rating indicated.

2.05 FABRICATION

- A. Fabricate flush wood doors in sizes indicated for Project site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.

2.06 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI System TR-6 catalyzed polyurethane.
 - 3. Staining: Refer to Section 09001 - FINISH AND MATERIAL SCHEDULE.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Hardware: For installation see Section 08710 - FINISH HARDWARE.
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors that do swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.

END OF SECTION 08211

SECTION 08710 – FINISH HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. NOTE – An inventory of Finish Hardware exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Finish Hardware to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Finish Hardware used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Finish Hardware is included under the Work of this Section whether using existing inventory or newly furnished.
- B. Work covered by this Section consists of furnishing and installing all finish hardware as shown on the Drawings, indicated on schedules, and as specified herein.
 - 1. Hardware for labeled openings shall meet UL requirements whether specified herein or not.
 - 2. All hardware on accessible doors shall meet or exceed the requirements of the Americans with Disabilities Act (ADA).

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. INTERIOR ALUMINUM DOOR FRAMES: Section 08125.
- C. FLUSH WOOD DOORS: Section 08211.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the latest adopted editions of the following:
 - 1. Florida Building Code.
 - 2. National Fire Protection Association (NFPA):
 - a. NFPA 80 Fire Doors and Fire Windows.
 - b. NFPA 101 Life Safety Code.

1.04 SUPPLIER QUALIFICATIONS

- A. Finish Hardware shall be furnished by one supplier, approved by the Architect, with appropriate technical knowledge and experience to correctly interpret Drawings and Specifications. Supplier shall be prepared at all times during progress of installation to promptly provide a qualified Architectural Hardware Consultant (AHC) to approve its complete installation, in order that all items shall be installed in the best manner and function properly. This will necessitate a project site visit prior to final inspection. Supplier shall be bona-fide direct distributor of all materials furnished.
- B. It shall be the supplier's responsibility to furnish hardware in accordance with the intent of this specification. Where, by virtue of architectural design or by function, a change is necessary, hardware of equal design and quality shall be furnished upon written approval of Architect.

1.05 SUBMITTALS

- A. Product Data: Submit complete product data for each item of finish hardware listed in the Finish Hardware Schedule. Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Finish Hardware Schedule: Submit complete typewritten sets of the Finish Hardware Schedule. Organize the Hardware Schedule into door hardware sets indicating complete designations of every item required for each door. Organize door hardware sets in the same order as in Article 3.03 - FINISH HARDWARE SCHEDULE. No factory order shall be placed for finish hardware items until approval has been given by the Architect.
 - 1. Each item in the Finish Hardware Schedule shall be identified on the first page of the Schedule by the manufacturer's name.
- C. Keying Schedule: Submit a keying schedule prepared by the supplier, detailing the Owner's keying instructions for locks. Include a schematic keying diagram and index each key to unique door designations. Refer to keying schedule at the end of this Section for additional information.
- D. Supplier Qualifications: Submit documented evidence of supplier's qualifications.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all items of finish hardware to the Project site, or as otherwise specified or required, and shall be checked in for completeness and familiarization with the Contractor.
- B. All items of finish hardware shall be packaged, numbered, and labeled to identify each opening for which it is intended, and to correspond with item numbers on the approved Finish Hardware Schedule.

1.07 COORDINATION

- A. Templates: All finish hardware to be installed on, or in metal doors and/or frames, shall be manufactured to template. Template machine screws shall be furnished for all such materials. Supplier shall furnish an approved Finish Hardware Schedule and all necessary template transmittals to metal frame fabricators, or other suppliers requiring same, for their coordination and use.
- B. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to building systems, including power supplies.

PART 2 - PRODUCTS

2.01 GENERAL

- A. An asterisk (*) after a manufacturer's name denotes whose product designation is used in the Finish Hardware Schedule for purposes of establishing minimum requirements.
- B. Other than those doors that are restricted to less than 180 degree opening by building or by overhead holders or stops, all butts and closer arms shall be of sufficient size to allow full 180-degree opening of doors.

2.02 FINISHES

- A. All finish hardware shall have a polished stainless steel finish.

2.03 LOCATIONS

- A. Hardware locations dimension shall be as follows:

1. Distance from finish floor to center line of:
 - a. Door Knob or Lever: 38 inches.
 - b. Door Pull: 42 inches.
 - c. Deadlock: 60 inches.
 - d. Exit Bolt Cross Bar: 38 inches.
 - e. Push Plate: 50 inches.
2. Butt Hinges:
 - a. Bottom Hinge: Finish floor to bottom of hinge 10 inches.
 - b. Top Hinge: Head rabbet to top of hinge 5 inches.
 - c. Center Hinge: Equidistant between top and bottom hinges.

2.04 BUTT HINGES

- A. Doors (1-3/4 Inch Thick): Minimum 4-1/2 inches high.
- B. Each door shall not have less than three hinges.
- C. All butts used with door closers shall be ball bearing.
- D. All exterior (or Lobby type) out-swinging doors shall have butts with non-removable pins (NRP).
- E. Products: Provide butt hinges by one of the following manufacturers:
 - 1. Hager Companies.*
 - 2. Lawrence Brothers, Inc.
 - 3. McKinney Products Co. Div. of ESSEX Industries, Inc.
 - 4. Stanley Commercial Hardware Div. of The Stanley Works.

2.05 LOCKSETS

- A. Locksets shall be furnished in the functions as specified in the hardware sets.
- B. Levers, escutcheons, locksets and cylinders shall be the products of one manufacturer.
- C. Minimum wall thickness of levers and roses shall be .101 inch and .099 inch, respectively.
- D. All latch bolts shall have 3/4 inch throw. All deadbolts shall have hardened steel inserts and 1 inch throw.
- E. Basis of Design: "D-Series" lockset and "Rhodes" handle design; Schlage Lock Company, An Ingersoll-Rand Company.* Subject to compliance with requirements, equivalent locksets by one of the following manufacturers are also acceptable:
 - 1. Corbin Russwin Architectural Hardware Div. of Yale Security Inc.
 - 2. Sargent Manufacturing Company Div. of ESSEX Industries, Inc.

2.06 KEYING/KEY CONTROL SYSTEM

- A. Keying: All locks shall be Grand Master Keyed as indicated.

- B. Key Control System: Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by systems manufacturer, with capacity for 150 percent of the number of locks required for the Project.
 - 1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final keying schedule.
 - 2. Provide hinged-panel lockable type cabinet for wall mounting as indicated on Drawings.
- C. Construction Keying (Construction Master Keys): Provide cylinders with feature that permits voiding of construction keys by use of the Owner's master key without cylinder removal and without the need for special tools. Provide 10 construction master keys.

2.07 FLUSH BOLTS

- A. Flush bolts shall be designed for mortising into door edge. Lever extension type.
- B. Bolt Throw: Comply with the following requirements:
 - 1. Mortise Flush Bolts: Minimum 3/4 inch throw.
- C. Products: Provide one of the following:
 - 1. "No. 282D"; Hager.*
 - 2. "No. 458-1/2"; H.B. Ives.
 - 3. "No. 555"; Rockwood Manufacturing Company.

2.08 CLOSERS

- A. Closers shall be provided in the manufacturer's recommended printed size for specified installation condition, unless otherwise noted in the Finish Hardware Schedule.
- B. Closers shall be full rack and pinion complete with back check. Springs shall be motor clock type. Furnish flush mount transom brackets where no transom bar exists. Furnish parallel arm where required.
- C. All closers shall be provided with limited opening resistance to meet handicap requirements.
- D. Furnish drop plate brackets where required.
- E. Closer at exterior doors shall be installed on the inside of the building.

F. Basis of Design: "Series 4011" and "Series 4111"; LCN Closers.* Equivalent products by one of the following manufacturers are also acceptable:

1. Sargent Manufacturing Company.
2. Norton Door Controls.
3. Corbin Russwin Architectural Hardware.

2.09 DOOR TRIM

A. Products: Provide the following door trim items by one of the manufacturers specified herein:

1. Push Plates: 0.050 inch thick; beveled top and sides.
 - a. "100/8x16"; Baldwin Hardware Corporation.
 - b. "8200"; H.B. Ives.
 - c. "No. 70"; Rockwood Manufacturing Company.*
2. Pull Plates: 0.050 inch thick plates, beveled top and sides.
 - a. "100x943/4x16"; Baldwin Hardware Corporation.
 - b. "8302-6"; H.B. Ives.
 - c. "111x70C"; Rockwood Manufacturing Company.*
3. Kick Plates and Armor Plates: 0.050 inch thick; beveled top and sides.
 - a. Baldwin Hardware Corporation.
 - b. Hager Companies.
 - c. H.B. Ives.
 - d. Rockwood Manufacturing Company.

2.10 DOOR STOPS

A. Products: Provide door stop types as follows:

1. Products by Hager:
 - a. Wall: "236W."
2. Products by H.B. Ives:
 - a. Wall: "No. 407-1/2."
3. Products by Rockwood Manufacturing Company:
 - a. Wall: "No. 409."

2.11 SILENCERS

- A. For all interior metal door frames, unless otherwise indicated.
- B. Products: Provide one of the following silencer types:
 1. "Type 20"; H.B. Ives.*
 2. "Type 64"; Glynn-Johnson, An Ingersoll-Rand Company.
 3. "No. 608"; Rockwood Manufacturing Company.

2.14 FASTENERS

- A. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Preparation: Comply with the following:
 1. Aluminum Frames: Comply with Door and Hardware Institute (DHI) A115 Series, "Specifications for Steel Door and Frame Preparation for Hardware (ANSI)."
 2. Wood Doors: Comply with DHI A115-W Series, "Wood Door Hardware Standards - Hardware Preparation (ANSI)."
- B. Mount hardware units at heights indicated in the following applicable publications, except as specifically listed herein under Article 2.03 LOCATIONS, and/or otherwise directed by the Architect and required to comply with governing regulations.
 1. Aluminum Frames: Comply with DHI "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: Comply with DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- C. Install each hardware item in compliance with the manufacturer's published instructions and current recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation or application of surface protection with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- D. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
- E. Clean adjacent surfaces soiled by hardware installation. Clean operating items as necessary to restore proper function and finish.

3.03 FINISH HARDWARE SCHEDULE

- A. The following Hardware Sets apply to the building and are based on door location types as indicated. Refer to Drawings for specific door numbers, sizes, types, swings, and hardware sets.

SET NO. 11

Door Nos.: 103, 104

Each To Have:

Hinges	3	Hager BB1168 4-1/2 x 4-1/2
Pull	1	Hager 33E
Pushplate	1	Hager 8 x 16
Closer	1	LCN 4111EDA
Kickplate	1	Ives 8 x 2" LDW
Wall Stop	1	Hager 236W

SET NO. 12

Door Nos.: 105, 106, 107, 109, 111, 112, 113, 116

Each To Have:

Hinges	3	Hager BB1279 4-1/2 X 4-1/2
Lockset	1	Schlage D53PD RHO
Closer	1	LCN 4111 EDA
Kickplate	1	Ives 8 x 2" LDW
Wall Stop	1	Hager 236W

EXISTING DOORS, FRAMES AND HARDWARE

Door Nos: 101, 110

“Existing Door and Hardware to Remain”

Door No. 117

“Existing Door and Frame to be Relocated”

END OF SECTION 08710

SECTION 08800 – GLASS AND GLAZING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This work includes glass and glazing required for:
 - 1. Interior wood doors.
- B. Definitions:
 - 1. "Glass" includes both primary and fabricated glass products as described in GANA "Glazing Manual."
 - 2. "Glazing" includes glass installation and materials used to install glass.

1.02 RELATED WORK

- A. JOINT SEALANTS: Section 07920.
- B. FLUSH WOOD DOORS: Section 08211.
- C. FINISH AND MATERIAL SCHEDULE: Section 09001.
- D. TOILET ROOM ACCESSORIES: Section 10800.

1.03 PERFORMANCE CRITERIA

- A. Provide glass and glazing that has been produced, fabricated, and installed to withstand normal impact loading (where applicable), without failure of sealants or gaskets to remain airtight, deterioration of glass and glazing materials, and other defects in the work.
- B. Provide monolithic glazed assemblies that have been produced and fabricated to comply with requirements for system performance characteristics as demonstrated by testing manufacturer's corresponding stock systems.

1.04 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide materials obtained from one source for each type of glass and glazing product indicated.
- B. Source Quality Control: All glass shall bear the manufacturer's identifying label.
- C. Safety Glazing Standard:
 - 1. Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z 97.1, and testing requirements of 16 CFR Part 1201 for category II materials.

2. Comply with Florida Statues - Chapter 553, Part III, Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
3. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glass Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

D. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:

1. American Architectural Manufacturers Association (AAMA):
 - a. AAMA Voluntary Specifications and Test Methods for Sealants.
2. American National Standards Institute (ANSI):
 - a. ANSI Z 97.1 Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
3. American Society for Testing and Materials (ASTM):
 - a. ASTM C 1036 Standard Specification for Flat Glass.
 - b. ASTM C 1048 Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.
- B. Samples: Submit three (3) - 12 inch square samples of each type of glass scheduled for installation, and three (3) - 12 inch lengths of each type of gasket employed.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Product Delivery: Deliver glass to job site in suitable containers that will provide protection from weather and breakage.
- B. Storage and Handling: Comply with manufacturer's published directions and as required to prevent edge damage to glass and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes; and keep glass free from contamination by materials capable of staining material.

1.07 PROJECT CONDITIONS

- A. Measurements: Sizes for glass shall be measured from the actual installed openings, frames, and doors.
- B. Environmental Requirements: Perform glazing when ambient temperature is above 40 degrees F., and on dry surfaces only.
- C. Sequence, Scheduling: Schedule glass deliveries to coincide with glazing schedules.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide glass products by one of the following manufacturers:
 - 1. Interpane Glass Company.
 - 2. Guardian Industries.
 - 3. PPG Industries, Inc.
 - 4. Pilkington Libbey-Owens-Ford.
 - 5. Viracon.

2.02 GLASS MATERIALS

- A. Glass Standards:
 - 1. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable; form, finish, mesh and pattern.
 - 2. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, and, if applicable; form, finish, and pattern.
- B. Glass Types:
 - 1. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), 1/4 inch thick unless otherwise indicated or specified.

2.03 GLAZING MATERIALS

- A. General: Comply with recommendations of sealant and glass manufacturers for selection of glazing materials which have performance characteristics suitable for applications indicated and conditions at time of installation.
 1. Select glazing materials with proven compatibility with surfaces contacted in the installation and under service conditions indicated, as demonstrated by testing and field experience.
- B. Glazing Sealants:
 1. Silicone Glazing Sealant: Single component elastomeric silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25.
 2. Colors: Provide color of exposed sealants as selected by Architect from manufacturer's standard colors.
 3. Products: Provide one of the following glazing sealants:
 - a. "Chem-Calk 1000"; Bostik.
 - b. "Dow Corning 790"; Dow Corning Corp.
 - c. "Silglaze 2800"; GE Silicones.
 - d. "Silpruf"; GE Silicones.
 - e. "864"; Pecora Corp.
 - f. "Omniseal"; Sonneborn Building Products Div. of Chemrex, Inc.
- C. Preformed Butyl-Polyisobutylene Glazing Tape:
 1. Blend of butyl polyisobutylene rubber with a solid content of 100 percent, in extruded tape form, complying with AAMA 807.3, packaged on rolls with a release paper on side, with or without continuous spacer rod as recommended by manufacturers of tapes and glass for application indicated.
 2. Products: Provide one of the following glazing tapes:
 - a. "PTI 606"; H.B. Fuller Company.
 - b. "PTI 303"; H.B. Fuller Company.
 - c. "Tremco 440 Tape"; Tremco, Inc.
 - d. "MBT-35"; Tremco, Inc.
 - e. "Extru-Seal"; Pecora Corp.

D. Glazing Gaskets:

1. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene or EPDM gaskets of profile and hardness required to maintain watertight seal; complying with ASTM C 864, Option 1.
2. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.
3. Products: Provide gaskets by one of the following manufacturers:
 - a. D.S. Brown Co.
 - b. Maloney Precision Products Co.
 - c. Tremco Inc.

E. Setting Blocks: Neoprene, EPDM, or silicone blocks are required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

F. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape, and hardness recommended by glass and sealant manufacturers for application indicated.

G. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

H. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

2.05 FABRICATION

- A. Sizes: Fabricate glass and glazing material to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.
- B. Tong Marks: Provide tempered glass produced by manufacturer's special process which eliminates tong marks, for locations and installation condition where tong marks would otherwise be exposed. No exposed tong marks shall be permitted.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
- B. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
- C. Presence and functioning of weep system.
- D. Minimum required face or edge clearances.
- E. Effective sealing between joints of glass framing members.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.03 INSTALLATION

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Where "Heat Treated" glass is noted, it shall be Heat Strengthened except where "Fully Tempered" is required at doors, adjacent sidelights, and other areas as required by Florida Building Code.
- C. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- D. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- E. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.04 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08800

DIVISION 09

FINISHES

SECTION 09001 – FINISH AND MATERIAL SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section comprises the Finish and Material Schedule for this Project. The schedule is attached to the end of this Section.

1.02 RELATED WORK

- A. INTERIOR ALUMINUM DOOR FRAMES: Section 08125.
- B. GYPSUM WALLBOARD: Section 09250.
- C. TILE WORK: Section 09300.
- D. ACOUSTICAL CEILINGS: Section 09510.
- E. RESILIENT BASE: Section 09650.
- F. SHEET VINYL FLOOR COVERINGS: Section 09652.
- G. PAINTING: Section 09900.
- H. TOILET PARTITIONS: Section 10160.
- I. TOILET ROOM ACCESSORIES: Section 10800.
- J. STEEL LABORATORY CASEWORK: Section 12345.
- K. VERTICAL LOUVER BLINDS: Section 12492.
- L. SIGNAGE: Section 10425.

PART 2 - PRODUCTS

2.01 FINISH AND MATERIAL SCHEDULE

- A. The Finish and Material Schedule is attached to the end of this Section.

PART 3 – EXECUTION

3.01 FINISH AND MATERIAL SCHEDULE

<u>LOCATION</u>	<u>COLOR/NUMBER/SIZE</u>	<u>MANUFACTURER</u>
LAB SHEET FLOORING	“Medintech Tandem” Delphinium, 91474	Armstrong
CT1 - CERAMIC TILE	“Ice White” Gloss EA25 (Nominal 4” x 4” w/ coved edge base tile thru-out)	American Olean
CT2 - ACCENT TILE	“Navy” 117	American Olean
CT3 - RESTROOM CERAMIC TILE	“Golden Nugget” 5208 (6” x 6”)	Dal-Tile
CT4 - RESTROOM CERAMIC TILE	“Matte Almond” 6565 (2” x 2”)	Dal-Tile
ARCHITECTURAL WOOD SPECIES TYPE	“Clear Maple”	
DOOR, WOOD TRIM STAIN COLOR	“Burnt Pecan”	Minwax
MILLWORK PLASTIC LAMINATE	“Mystique Moonlight” 4757-60	Wilsonart
MILLWORK COUNTERTOP PLASTIC LAMINATE	“Navy Legacy” 4651-60	Wilsonart
VINYL BASE	“Navy Blue” TCBR-18	Johnsonite
WINDOW TREATMENT	“Cotton” 111, Aluminum Vertical Mini-Blinds (1”)	Levolor
ACOUSTICAL CEILING TILE	“Ultima” Beveled Tegular w/ “Sonata” 9/16” Dimensional Tee Grid	Armstrong
P1 - OFFICE PAINT COLOR	“Luminous White Satin” SW 1900 LRV 91%	Sherwin Williams
P2 – CEILING PAINT COLOR	“Ceiling Bright White” SW 7007 (Washable Surface)	Sherwin Williams
P3 – INTERIOR STEEL DOOR FRAME COUNTER	Match Interior Aluminum Door Frame Color Kawneer “Midnight Blue”	Sherwin Williams

3.01 FINISH AND MATERIAL SCHEDULE – *Continued* . . .

<u>LOCATION</u>	<u>COLOR/NUMBER/SIZE</u>	<u>MANUFACTURER</u>
INTERIOR DOOR FRAME COLOR	“Midnight Blue” Interpon D2000 Advanced Powder Coating	Kawneer
SIGNS	(Refer to Architectural Drawing Sheet 2A6.2)	

END OF SECTION 09001

SECTION 09250 – GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing and installation of gypsum wallboard as indicated on the Drawings and specified herein.

1.02 RELATED WORK

- A. COLD FORMED METAL FRAMING: Section 05400.
- B. JOINT SEALANTS: Section 07920.
- C. TILE WORK: Section 09300.
- D. PAINTING: Section 09900.
- E. TOILET PARTITIONS: Section 10160.
- F. FIRE PROTECTION SPECIALTIES: Section 10520.
- G. TOILET ROOM ACCESSORIES: Section 10800.
- H. STEEL LABORATORY CASEWORK: Section 12345.

1.03 QUALITY ASSURANCE

- A. Where work is indicated for fire-resistance ratings, including those required to comply with governing regulations, the materials and installation shall be identical to those applicable assemblies which have been tested and approved by recognized authorities, including Underwriters' Laboratories (UL) and Factory Mutual Global (FMG).
- B. The requirements of Gypsum Association (GA) GA-216 "Application and Finishing of Gypsum Board Specifications" shall apply where applicable, except where more detailed or more stringent requirements are indicated, including the recommendations of the manufacturer.
- C. A maximum of 1/8 inch offsets between planes of board faces, and 1/4 inch in 8 feet for plumb, level, warp, and bow shall be allowed.
- D. Single Source Responsibility: Gypsum wallboard materials shall be from one manufacturer, and the source of brands of materials shall not be changed during construction.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for each manufactured product.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Materials shall be delivered in sealed containers and bundles, fully identified with the manufacturer's name brand, type and grade. Materials shall be stored in a dry, well-ventilated space, protected from the weather, under cover, and off the ground.
- B. Gypsum wallboard shall not be stored for more than one (1) month after delivery.

PART 2 - PRODUCTS

2.01 METAL SUPPORT MATERIALS

- A. General: The requirements of GA-203 shall apply where applicable, except where more detailed or stringent requirements are indicated, including the recommendation of the manufacturer.
- B. Metal Studs and Furring Members: Specified in Section 05400 – COLD-FORMED METAL FRAMING.
- C. Fasteners: Type and size recommended by the manufacturer for the substrate and application as indicated.
 - 1. Screws attaching gypsum board to metal studs shall be corrosion resistant No. 6 Phillips bugle-head drywall screws designed for fastening to metal, sized to be 3/8 inch longer than total thickness of gypsum board and metal studs.

2.02 GYPSUM BOARD

- A. General: Gypsum board shall be 5/8 inch thick unless otherwise indicated on the Drawings with tapered long edges and in maximum available lengths to minimize end joints. Comply with ASTM C 36.
 - 1. Provide fire-rated gypsum board where indicated on the Drawings as "Type-X," "Firecode," or "fire rated" and as required for fire-resistance-rated assemblies.
- B. Cementitious Backer Units: Provide where indicated for showers. Comply with ANSI A118.9.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Wonderboard; Custom Building Products.
 - b. Util-A-Crete Concrete Backer Board; FinPan, Inc.
 - c. DUROCK Cement Board; United States Gypsum Co.
 - 2. Thickness: As indicated on Drawings.

- C. Water Resistant Type: Provide where indicated and/or required in toilet rooms, janitor's closet, and other "wet" areas. Comply with ASTM C 630.
- D. Veneer Plaster Applications: Gypsum board where indicated as a base for veneer plaster applications shall comply with ASTM C 588.
- E. Products: Provide products by one of the following manufacturers.
 - 1. G-P Gypsum Corporation.
 - 2. National Gypsum Company.
 - 3. United States Gypsum Company.

2.03 ACCESSORIES

- A. Casing beads shall be of type for securing through face of tapered edge, and embedding and taping to conceal surface flange. U-moldings and channel-shaped plaster/stucco type casing beads are NOT acceptable.
 - 1. Products: Provide one of the following:
 - a. "D-200 Series L Bead"; Dale Industries, Inc.
 - b. "No. 200 Wallboard Casing"; National Gypsum Company.
 - c. "No. 200 Series"; United States Gypsum Company.
- B. Corner beads shall be of standard type of solid zinc with perforated surface flanges to be attached through each gypsum face and concealed by embedding, of sizes for pertinent application.
 - 1. Products: Provide one of the following:
 - a. "Drywall Corner Bead"; Dale Industries, Inc.
 - b. "Gold Bond Wallboard Cornerbead"; National Gypsum Company.
 - c. "Dur-a-Bead Corner Bead"; United States Gypsum Company.
- C. Control joints shall be one-piece, formed with vee-shaped slot per Figure 1 in ASTM C 1047, with slot opening covered with removable strip.
- D. Exterior accessories shall be solid zinc. Interior accessories shall be galvanized.

2.04 JOINT TREATMENT MATERIALS

- A. Joint tapes shall be plain or perforated complying with ASTM C 475.

B. Joint compound shall be adhesive, with or without fillers complying with ASTM C 475. Provide in dry powder form or pre-mixed ready for application as follows:

1. Single-Compound: Provide manufacturer's single-component compound for both bedding and finishing joints.
2. Two-Compound Treatment: Provide compatible joint compounds: one compound for bedding and other compound for finishing joints.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the gypsum board is to be installed. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF GYPSUM WALLBOARD

A. Comply with GA-216, unless the manufacturer's published instructions or requirements for fire-resistance ratings are more stringent.

B. Wall boards shall be installed horizontally to avoid end-butt joints wherever possible. Locate end joints over supports and stagger in alternate courses of board. Maintain 3/8 inch gap between bottom of gypsum board and floor.

C. Steel studs in concealed spaces (above ceilings, etc.) except in chase walls which are properly braced internally, shall have both faces covered in gypsum wallboard.

3.03 INSTALLATION OF GYPSUM BOARD TRIM ACCESSORIES

A. Where feasible, trim accessory flanges shall be anchored using same fasteners as required to fasten gypsum board to the supports. Otherwise, flanges shall be fastened by nailing or stapling, unless otherwise recommended by manufacturer.

B. Metal corner beads shall be installed at all external corners of gypsum board work with fasteners, driven down to be fully concealed by joint compound.

C. Continuous casing beads shall be installed wherever gypsum board terminates in visible locations (and is not concealed by extending behind other materials), abutting to other building components, i.e. masonry and windows.

D. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.04 GYPSUM BOARD FINISHING

- A. Exposed drywall surfaces shall be finished with joints, corners, and exposed edges reinforced or trimmed as specified, and with all joints, fastener heads, trim accessory flanges and surface defects filled with joint compound in accordance with manufacturer's recommendations for smooth flush surfaces. True, level, or plumb lines shall be formed, without joints, fastener heads, flanges of trim accessories, or defects visible after application for field-applied paint finish.
- B. Joint tape shall be used to reinforce joints formed by tapered edges or butt ends of drywall units, and at interior corners and angles, with tape set in joint compound and skim coat applied over tape on application. Where open spaces of more than 1/16 inch width occur between abutting drywall units, joints shall be filled with joint compound and allowed to dry before application of joint tape.
- C. After mixing, joint compounds shall not be used if recommended pot-life time has expired. Drying time between applications of joint compound shall be in accordance with manufacturer's recommendations for relative humidity and temperature levels at time of application, in no case allowing less than 24 hours drying time between applications of joint compound. Not less than three (3) separate coats of joint compound shall be applied over joints, fasteners heads and metal flanges. Except at sound-rated or fire-rated wall assemblies, joint compound treatment is not required above suspended ceilings where partitions are shown to extend to structural deck.
- D. All openings around pipes, fixtures, ducts, etc. shall be sealed flush with water-proof, non-hardening, sealant compound. Penetrations of fire-resistance assemblies shall be sealed with fire-resistant sealant in accordance with Section 07920 - JOINT SEALANTS.
- E. All joints, corners, dimpled heads, and depressions in wallboard surfaces shall be finished with joint compound and topping compound as recommended by the compound manufacturer, leaving all wallboard surfaces smooth and ready for paint finish.

END OF SECTION 09250

SECTION 09255 – VENEER PLASTER

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide all labor, equipment and materials necessary to apply veneer plaster (hardcoat) system to gypsum drywall ceilings located and detailed on Drawings.

1.02 RELATED WORK

- A. COLD FORMED METAL FRAMING: Section 05400.
- B. GYPSUM WALLBOARD: Section 09250.
- C. JOINT SEALANTS: Section 07920.
- D. PAINTING: Section 09900.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions of the following:
 - 1. American Society for Testing and Materials (ASTM).
- B. Applicator Qualifications:
 - 1. Installation shall be performed only by a qualified installer with at least five (5) years experience in installations of a similar nature.
- C. Single Source Responsibility:
 - 1. Obtain products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of veneer plaster.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit six (6) sets of manufacturer's product specifications and installation instructions for veneer plaster system, including other data as may be required to show compliance with these Specifications.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Comply with recommendations of veneer plaster manufacturer, for environmental conditions before, during and after application of veneer plaster.
2. Provide ventilation in building spaces as required to remove water in excess of that required for hydration of veneer plaster immediately after its application.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements provide products of one of the following:

1. Veneer Plaster:
 - a. United States Gypsum Co.
 - b. Gold Bond Building Products Div., National Gypsum Co.
 - c. Georgia-Pacific Corp.

2.02 MATERIALS

A. Gypsum Base for Veneer Plaster:

1. Refer to Section 09250 –GYPSUM WALLBOARD.

B. Two-Component Veneer Plaster:

1. ASTM C 587; manufacturer's standard products consisting of separate base coat and finish coat materials; minimum compressive strength of 2500 psi per ASTM C 472; manufactured as follows:

a. Veneer Plaster Base Coat:

- (1) Imperial Basecoat; United States Gypsum Co.
- (2) Kal-Kote; Gold Bond Building Products Div., National Gypsum Co.
- (3) Dens-Cote; Georgia-Pacific Corp.

b. Veneer Plaster Finish Coat:

- (1) Imperial Finish; United States Gypsum Co.
- (2) Kal-Kote Finish; Gold Bond Building Products Div., National Gypsum Co.
- (3) Dens-Cote; Georgia-Pacific Corp.

2. Bonding agent where required and/or recommended by veneer plaster manufacturer shall comply with ASTM C 631.

PART 3 - EXECUTION

3.01 VENEER PLASTER APPLICATION

- A. Gypsum Veneer Plaster Application Standard: Comply with ASTM C 843.
- B. Mixing/Application: Machine mix plaster, except for small amounts of work requiring less than one (1) bag of plaster; and apply to substrate by hand as required to produce the required texture of finished plastering. Trowel veneer plaster finish-coat to a smooth, dense finish to match existing.
- C. Plastering: Provide 2-component application of veneer plaster on surfaces shown or scheduled for veneer plaster finish. Apply veneer plaster base-coat and veneer plaster finish-coat in separate plastering operations, and dry each coat.
- D. Use bonding agent where required and/or as recommended by veneer plaster manufacturer.

3.02 CLEANING AND PROTECTION

- A. Remove temporary coverings used to protect other work.
- B. Remove veneer plaster spillage promptly from door frames, windows and other adjoining work. Repair surfaces which have been damaged by veneer plaster system work.
- C. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures veneer plaster system work being performed without damage or deterioration at time of Substantial Completion.

END OF SECTION 09255

SECTION 09300 – TILE WORK

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Tile materials exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Tile materials to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Tile materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Tile materials is included under the Work of this Section whether using existing inventory or newly furnished.
- B. Furnish and install all ceramic tile as indicated on Drawings.
- C. Types of tile work, in general, shall include the following:
 - 1. Ceramic floor and wall tile.
 - 2. Ceramic tile showers.
 - 3. Marble thresholds and trim.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. FINISH AND MATERIAL SCHEDULE: Section 09001.
- C. GYPSUM WALLBOARD: Section 09250.

1.03 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation shall be performed only by a qualified installer with at least five (5) years documented experience in installations of a similar nature.
- B. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:
 - 1. Tile Council of America (TCA):
 - a. Handbook for Ceramic Tile Installation.

2. American National Standards Institute (ANSI):
 - a. ANSI A108.10 "Specifications for Installation of Grout in Tile Work."
 - b. ANSI A118.4 "Specifications for Latex-Portland Cement Mortar."
 - c. ANSI A137.1 "Specifications for Ceramic Tile."
3. American Society for Testing and Materials (ASTM):
 - a. Referenced Standards.

C. Source of Materials: Provide materials obtained from one source for each type and color of grout and setting materials.

1.04 SUBMITTALS

- A. Schedule of Tile Materials: Submit schedule of all Tile materials including a breakdown of materials supplied from Owner's existing inventory.
- B. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.
- C. Shop Drawings: Submit shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with Architect.
- D. Samples: Submit samples of the following:
 1. Samples for each type of tile and for each color and texture required, not less than 12 inches square, on plywood or hardboard backing and grouted.
 2. Three (3) samples of the specified marble material for thresholds and trim. Submit finished samples in 6 inch lengths.
 3. Samples shall be representative of all color range extremities and individually identified by numbers placed on the samples.
 4. Installed materials shall match approved samples.
- E. Installer Qualifications: Submit documented evidence of installer's qualifications.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All ceramic tile shall be graded and containers grade-sealed in accordance with minimum grade specifications established in ANSI A137.1.
- B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Store and handle materials in a manner to prevent damage or contamination with water or foreign matter.

1.06 PROJECT CONDITIONS

- A. Protect the adjoining surfaces and the work of other trades at all times.
- B. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Products: Provide products of one of the following manufacturers:

1. Ceramic and Marble Tile:
 - a. American Olean Tile Co., Inc.
 - b. Dal-Tile Corp.
 - c. Mid-State Tile.
 - d. Summitville Tiles, Inc.
 - e. United States Ceramic Tile Co.
 - f. Winburn Tile Mfg. Co.
2. Grout:
 - a. Bostik.
 - b. Mapei Corp.
 - c. Laticrete International, Inc.

2.02 MATERIALS

- A. Ceramic Tile: Ceramic floor tile, wall tile, cove base, accent strips, and all trim required:
 1. Standard Grade conforming to ANSI A137.1.

2. Sizes: 18" x 18", 6" x 6", 4" x 4", and 2" x 2". Refer to Drawings for locations.
3. Basis of Design, Products and Colors: Refer to Section 09001 - FINISH AND MATERIAL SCHEDULE.
4. Factory mount floor tile into units or sheets to facilitate handling and installation.

B. Marble Thresholds and Trim: Provide marble thresholds at all entrances to toilet rooms and marble sills at windows indicated complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241. Marble thresholds and sills shall extend the entire width of the door frame or window frame. Top of threshold shall be set no more than 1/4 inch above highest adjacent floor surface, and edges shall be chamfered.

1. Provide one-piece units, where possible. For window openings larger than 6 feet; joints shall align with mullions.
2. Colors: Refer to Drawings.

2.03 TILE AND SETTING AND GROUTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.1, composition as follows:

1. Manufacturer's standard latex additive (water emulsion), serving as replacement for part or all of gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.
2. Products: Provide one of the following:
 - a. "Hydroment Tile-Mate" with "Hydroment Multi-Purpose Acrylic Latex 425"; Bostik.
 - b. "Laticrete 272 Premium Floor and Wall Thin-Set Mortar" with "Laticrete 3701 Mortar Admix"; Laticrete International, Inc.
 - c. "KERABOND" with "KERAPLASTIC"; Mapei Corp.

B. Chemical-Resistant, Water-Cleanable, Tile-Grouting Epoxy: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F. and 212 deg F., respectively, and certified by manufacturer for intended use.
2. Colors to be selected by Architect from manufacturer's standard range.

3. Products: Provide one of the following:
 - a. "Hydroment Color-Poxy"; Bostik.
 - b. "Laticrete 2000 Industrial Epoxy Grout"; Laticrete International, Inc.
 - c. "KER 400 Series KERAPOXY"; Mapei Corp.

2.04 MISCELLANEOUS MATERIALS

- A. One-Part Mildew Resistant Silicone Sealant:
 1. ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior ceramic tile corners, and joints in and around ceramic tile with plumbing fixtures.
 2. Products: Provide one of the following:
 - a. "Chem-Calk 900"; Bostik.
 - b. "Dow Corning 786"; Dow Corning Corp.
 - c. "Sanitary 1700"; GE Silicones.
- B. Shower Accessories:
 1. Provide shower liner, mesh and drainage aggregate per ANSI and TCA recommended guidelines.
 2. Provide ceramic soap holder for each shower stall in color to match tile. Mount on left side of shower faucet.
- C. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by the Ceramic Tile Institute of America (CTI).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Prior to commencement of work, all substrates to receive tile work shall be inspected to assure that the surfaces are ready for tile application. All surfaces shall be dry, clean and free of oily or waxy films. Do not proceed with work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.
- B. Do not start work until Electrical and Mechanical work in or behind tile work have been installed.

3.02 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile."
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation;" comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Determine location of all movement joints before starting tilework.
- D. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignments. Extend accent tiles to abut door jambs. Use bullnose tiles at door jambs.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars or covers overlap tile. Ensure that cut tiles occur in the most inconspicuous locations.
- F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown. Joints in floor tile and vertical joints in wall tile shall match.
- G. DO NOT use less than 1/2 tile at any location.
- H. Grout tile to comply with ANSI A108.10, using grout materials indicated.
 - I. Mix and install proprietary components to comply with grout manufacturer's directions.
 - J. Marble thresholds and trim to have all exposed faces smooth finished.
 - K. All 4" x 4" tile on walls shall have cove base adjoining floors.

3.03 INSTALLATION METHODS

- A. Install Tile to comply with requirements indicated below for setting bed methods, ANSI, and TCA installation methods related to types of substrate construction.
- B. Ceramic Tile Floors and Marble Thresholds:
 - I. Latex-Portland Cement Mortar and Epoxy Grout: ANSI A108.5.
 - a. Concrete Subfloors, Interior: TCA F115.

- C. Ceramic Tile Walls, Base, and Trim:
 - 1. Latex-Portland Cement Mortar and Epoxy Grout: ANSI A108.5.
 - a. Concrete Masonry Units, Interior: TCA W243.
- D. Shower Walls:
 - 1. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Metal Studs: TCA B411.
- E. Shower Receptors:
 - 1. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Metal Studs: TCA B416.

3.04 CLEANING AND PROTECTION

- A. Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
- B. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from the effects of acid cleaning. Flush surface with clean water before and after cleaning.
- C. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.
- D. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.
- E. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.

3.05 EXTRA STOCK

- A. Upon completion of work, deliver to the Owner extra tile of size and color used on the job, for use in future repair and maintenance work. Furnish tile in original boxes, properly marked, in quantities as listed below and in types and colors as directed.
 - 1. Ceramic Floor and Wall Tile: 3 percent of total quantity of each color.

END OF SECTION 09300

SECTION 09510 – ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Acoustical Ceiling materials exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 1. Coordinate the requirements of this Section with the Owner for providing additional Acoustical Ceiling materials to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 2. Additional Acoustical Ceiling materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 3. Installation of ALL Acoustical ceiling materials is included under the Work of this Section whether using existing inventory or newly furnished.
- B. Furnish and install all acoustical panels and suspension systems for acoustical ceilings complete as indicated on the Drawings and specified herein.
- C. Review Architectural, Mechanical and Electrical Drawings for layout, location, and pattern of acoustical panels, location of recessed light fixtures, ceiling diffusers, and grilles, details of suspension system, details of change of level, details at ceiling penetrations, access door locations, special edge treatment, and all necessary connections to work of other trades.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. FINISH AND MATERIAL SCHEDULE: Section 09001.
- C. AIR DISTRIBUTION DEVICES: Section 15900.
- D. LIGHTING FIXTURES: Section 16500.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Installation shall be performed only by a qualified installer with at least five (5) years documented experience in installations of a similar nature, and as approved by the manufacturer and Architect.

B. Design Criteria:

1. All finish materials specified under this Section shall have a minimum Class A flame spread rating of 25 or less when tested in accordance with ASTM E 84.
2. The Acoustical grid system shall conform to structural classifications of ASTM C 635, and those established by the Ceiling and Interior Systems Construction Association (CISCA).

1.04 SUBMITTALS

- A. Schedule of Acoustical Ceiling Materials: Submit schedule of all Acoustical Ceiling materials including a breakdown of materials supplied from Owner's existing inventory.
- B. Product Data: Submit product data for each type of product specified.
- C. Shop Drawings: Submit complete shop drawings. Shop drawings shall indicate sizes and layout of ceiling panels and suspension system component details. Manufacturer's names and product data shall be clearly indicated on all shop drawings.
- D. Samples: Submit three (3) full-size samples of each kind of acoustical material proposed for use including suspension system. Each sample shall bear a label indicating the type, quality, and color of the material, and shall bear the manufacturer's name.
- E. Installer Qualifications: Submit documented evidence of installer's qualifications.

1.05 PRODUCT, DELIVERY, STORAGE AND HANDLING

- A. The materials shall be delivered to the site in the manufacturer's original, unopened, labeled containers, or packages. Materials shall be stored in enclosed areas with same temperature and humidity conditions as areas in which materials are to be installed.
- B. All packages under this Section shall be properly marked on the outside with the identification of the material contained in the packages, so that they may be readily identified with the location to be used.

1.06 PROJECT CONDITIONS

- A. Mechanical and electrical equipment and fixture installers shall furnish all necessary supports for their materials independent of, and prior to, installation of suspended grid systems.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acoustical Ceiling Panels:

1. Description: Mineral fiber panels, 24 inches x 24 inches x 3/4 inch thick. Beveled tegular edge profile. CAC 35, 0.60 NRC, and 0.83 light reflectance. Class A fire resistance.
2. Compliance Standard: ASTM E 1264.
3. Basis of Design: "Ultima" beveled tegular; Armstrong World Industries.

B. Metal Suspension System:

1. Description: ASTM C 635 Intermediate-duty structural classification. Main tees and cross tees roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653 (G30), with prefinished 9/16 inch wide metal caps on flanges.
2. Dimensions: System to consist of main tees and cross tees, built to snap together modules of 24-inch x 24-inch for installation of lay-in acoustical ceiling panels.
3. Accessories shall be specifically designed as an integral part of the suspension system, and shall be installed in accordance with manufacturer's published recommendations.
 - a. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
 - b. Wire Hangers, Braces, and Ties: Zinc-coated carbon steel wire complying with ASTM A 641, Class 1 zinc coating, soft temper. Provide minimum 12 gauge diameter wire.
 - c. Metal Edge Moldings and Trim: Shall be fabricated from sheet metal of same material, finish, and color as that used for exposed flanges of tee.
4. There shall be no exposed fasteners.
5. Basis of Design: "Sonata 9/16" Dimensional Tee Grid"; Armstrong World Industries.

2.02 FABRICATION

- A. Suspension system components shall be designed to support the ceiling assembly indicated on project Drawings with maximum deflection of 1/360 of the span, including appropriate load-carrying capacity for acoustical panels, light fixtures, and HVAC elements, and shall be 1-1/2 inch high double-web intermediate main tees with 1-1/8 inch or 1-1/2 inch high cross tees.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which the acoustical ceiling system is to be installed. Do not proceed with acoustical ceiling work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Installation of acoustical ceilings shall be in strict accordance with the manufacturer's published instructions, unless otherwise specified.
- B. Install acoustical ceiling panels in a true and even plane, in straight line course laid out symmetrically about center lines of ceiling or panel. Border panels shall not be less than 6 inches wide. Unless shown otherwise on reflected ceiling plan Drawings, the work shall be so laid out that border panels shall be of the same width on opposite sides and fit neatly against vertical surfaces.
- C. Suspend main tees from structure by not less than 12 gauge, galvanized wire located not over 4 feet on center, attached to the acoustical panel suspension system from the structural system above. Do not suspend grid system from metal deck, HVAC ducts, electrical conduit, or plumbing lines. Use trapeze-type hangers at HVAC ducts over 4 feet wide. Joint cross tees shall be located by routs in web of transverse cross tees. Main tees and cross tees shall rest on angle moldings at walls. Tabs of cross tees intersecting cross tees shall remain unbent.
- D. Keep finished surface of acoustical ceiling panels free of soiling and left in a condition acceptable to Owner. Replace all damaged units at no cost to Owner.
- E. All suspension grid components damaged during construction activities shall be replaced prior to panel installation.

3.03 EXTRA STOCK

- A. Furnish to the Owner prior to Final Acceptance, extra stock of acoustical materials, consisting of a minimum of 2 percent of the area of each size, type, and thickness installed on the job. Properly package, seal, and identify stock materials.

END OF SECTION 09510

SECTION 09650 – RESILIENT BASE

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Resilient Base materials exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Resilient Base materials to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Resilient Base materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Resilient Base materials is included under the Work of this Section whether using existing inventory or newly furnished.
- B. Furnish and install resilient base and accessories complete as indicated on the Drawings and specified herein.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. FINISH AND MATERIAL SCHEDULE: Section 09001.
- C. TILE WORK: Section 09300.
- D. SHEET VINYL FLOOR COVERINGS: Section 09652.

1.03 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation shall be performed only by a qualified installer with at least five (5) years documented experience in installations of a similar nature.

1.04 SUBMITTALS

- A. Schedule of Resilient Base Materials: Submit schedule of all Resilient Base materials including a breakdown of materials supplied from Owner's existing inventory.
- B. Product Data: Submit manufacturer's technical data for resilient base and accessory.

- C. Samples: Submit three (3) each of the following samples of each type, color and pattern of resilient base required, showing full range of color and pattern variations.
 - 1. 2-1/2 inch long samples of resilient base and flooring accessories.
 - 2. Other materials as requested.
- D. Maintenance Instructions: Submit manufacturer's recommended maintenance practices for resilient base and accessory required.
- E. Installer Qualifications: Submit documented evidence of installer's qualifications.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Site in manufacturer's original unopened containers with manufacturer's brand name and color clearly marked thereon, and store in conformity with manufacturer's recommendations.

1.06 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65 degrees F in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Stored resilient base materials in spaces where they will be installed for at least 48 hours before beginning installation.
- B. Install resilient base and accessories after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 RESILIENT BASE

- A. 4 inch high vinyl base x 1/8 inch gage, ASTM F 1861, Type TV, with matching end stops and preformed or molded corner units.
- B. Basis of Design: "Navy Blue" TCBR-18; Johnsonite.
- C. Use set-on cove at tile and carpet areas, and straight base elsewhere.
- D. Provide set-on cove base at masonry walls where there is a tile floor.
- E. Supply in 96 foot rolls.

2.02 ACCESSORY MATERIALS

- A. Adhesives (Cements): Waterproof stabilized type as recommended by base manufacturer to suit material and substrate conditions.
- B. Patching Compounds: Latex type as recommended by base manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect wall surfaces to determine that they are satisfactory for resilient base installation. Wall surfaces shall be smooth and free from cracks, holes, ridges or coatings preventing adhesive bond, and other defects impairing performance or appearance.
- B. Do not allow resilient base work to proceed until wall surfaces are satisfactory.
- C. Do not start work until painting (where applicable) has been substantially completed.

3.02 PREPARATION

- A. Prepare wall surfaces as follows:
 1. Use patching compounds as recommended by resilient base manufacturer for filling small cracks, holes and depressions in walls.
 2. Remove coatings from wall surfaces that will prevent adhesive bond, include any compounds incompatible with resilient base adhesives, paint, oils, waxes and sealers.
- B. Clean surfaces to be covered and inspect walls.
- C. Apply in compliance with manufacturer's published instructions.

3.03 INSTALLATION

- A. Installation General:
 1. Install resilient base using method indicated in strict compliance with manufacturer's published instructions. Extend resilient base into toe spaces, door reveals, and into closets and similar openings.
 2. Scribe, cut and fit resilient base to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.
 3. Tightly cement resilient base to walls without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
- B. Installation of Accessories:
 1. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.

2. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 - a. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
3. Install resilient edging strips at edges of flooring which would otherwise be exposed. Place resilient edge strips tightly butted to flooring and secure with adhesive.

3.04 CLEANING AND PROTECTION

- A. Perform following operations immediately upon completion of resilient base:
 1. Remove excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient base manufacturer.
- B. Protect base against damage during construction period to comply with resilient base manufacturer's directions.
- C. Replace all damaged base at no cost to Owner.

3.05 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 1. Vinyl Base: 4 feet of each type installed.

END OF SECTION 09650

SECTION 09652 – SHEET VINYL FLOOR COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Sheet Vinyl Floor Covering materials exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Sheet Vinyl Floor Covering materials to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Sheet Vinyl Floor Covering materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Sheet Vinyl Floor Covering materials is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes sheet vinyl floor coverings without backing.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCES: Section 01020.
- B. FINISH AND MATERIAL SCHEDULE: Section 09001.
- C. TILE WORK: Section 09300.
- D. RESILIENT BASE: Section 09650.

1.03 SUBMITTALS

- A. Schedule of Sheet Vinyl Floor Covering Materials: Submit schedule of all Sheet Vinyl Floor Covering materials including a breakdown of materials supplied from Owner's existing inventory.
- B. Product Data: For each type of product specified.
- C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of sheet vinyl floor covering specified, showing the full range of variations expected in these characteristics.
 - 1. For heat-welding bead, manufacturer's standard size samples, but not less than 9 inches long, of each color specified.

- D. Qualification Data: For installer.
- E. Maintenance Data: For sheet vinyl floor coverings to include in maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project that are competent in heat-welding techniques required by manufacturer for floor covering installation.
- B. Source Limitations: Obtain each type, color, and pattern of sheet vinyl floor covering specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide products identical to those tested for fire exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet vinyl floor coverings and installation accessories to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather, with ambient temperatures maintained between 50 deg F. and 90 deg F. Store rolls upright.
- C. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.06 PROJECT CONDITIONS

- A. Maintain a temperature of not less than 70 deg F or more than 95 deg F in spaces to receive sheet vinyl floor coverings for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post installation period, maintain a temperature of not less than 55 deg F or more than 95 deg F.
- B. Do not install sheet vinyl floor coverings until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during sheet vinyl floor covering installation and for time period after installation recommended in writing by manufacturer.
- D. Install sheet vinyl floor coverings and accessories after other finishing operations, including painting, have been completed.

- E. Where items are indicated for installation on top of sheet vinyl floor coverings, install floor coverings before these items are installed.
- F. Do not install sheet vinyl floor coverings over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.
 - 2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: "Medintech"; Armstrong World Industries, Inc. Subject to compliance with requirements, equivalent products by one of the following manufacturers are also acceptable:
 - 1. Azrock Commercial Flooring.
 - 2. Congoleum Corporation.
 - 3. Tarkett Inc.

2.02 SHEET VINYL FLOOR COVERINGS

- A. Unbacked Sheet Vinyl Floor Coverings: ASTM F 1303, 0.080 inch thick.
- B. Basis of Design, Color and Pattern: "Medintech Tandem," Delphinium 91474; Armstrong World Industries, Inc.
- C. Wearing Surface: Smooth.
- D. Sheet Width: 6 feet.
- E. Seaming Method: Heat welded.
- F. Fire-Test-Response Characteristics:
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm. per ASTM E 648.

2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding seams.
 - 1. Color and Pattern: Match color and pattern of sheet vinyl floor covering.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of sheet vinyl floor coverings, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of floor coverings.
- B. Concrete Subfloors: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with floor covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install floor coverings until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

- A. Unroll sheet vinyl floor coverings and allow them to stabilize before cutting and fitting.
- B. Lay out sheet vinyl floor covering as follows:
 1. Maintain uniformity of sheet vinyl floor covering direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 3. Match edges of sheet vinyl floor coverings for color shading at seams.
 4. Avoid cross seams.
- C. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

- D. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- F. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of floor covering installed on covers. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- G. Adhere sheet vinyl floor coverings to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

3.04 CLEANING AND PROTECTING

- A. Perform the following operations immediately after completing floor covering installation:
 1. Remove adhesive and other blemishes from floor covering surfaces.
 2. Sweep or vacuum floor coverings thoroughly.
 3. Damp-mop floor coverings to remove marks and soil.
 - a. Do not wash floor coverings until time period recommended by manufacturer.
- B. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended in writing by manufacturer.
 1. Cover floor coverings with undyed, untreated building paper until Substantial Completion.
 2. Do not move heavy and sharp objects directly over floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09652

SECTION 09900 – PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the surface preparation and application of painting and related work in locations indicated on the Drawings and specified herein.

1.02 RELATED WORK

- A. METAL FABRICATIONS: Section 05500.
- B. INTERIOR ARCHITECTURAL WOODWORK: Section 06402.
- C. JOINT SEALANTS: Section 07920.
- D. FINISH AND MATERIAL SCHEDULE: Section 09001.
- E. GYPSUM WALLBOARD: Section 09250.

1.03 QUALITY ASSURANCE

- A. All surfaces of fabricated items that are left unfinished by the requirements of other Sections shall be painted under this Section. All work specified in this Section shall be in addition to shop and mill coats, priming and field coats which are specified in other Sections.
- B. Perform all touching up of shop coats and field coats of paint on structural steel and miscellaneous steel or iron as required and/or specified.
- C. Aluminum, steel, stainless steel, copper, bronze, chromium plating, nickel, monel metal, lead, lead coated copper and other surfaces with factory finishes shall not be painted or finished, except as otherwise specified.
- D. Remove and re-finish or otherwise correct in a manner approved by Architect all work under this Section which peels, crazes, blisters, fails to adhere or otherwise fails to properly serve its intended purpose at no additional cost to the Owner.

1.04 PRODUCT DELIVERY AND STORAGE

- A. All materials shall be delivered to the Site in manufacturers' sealed packages, with labels intact.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of product used.
- B. Samples: Submit three (3) sets of full color chip line for each type of paint specified, for color selection(s) by the Architect.

- C. Draw Downs: Provide three (3) stepped draw downs, defining each separate coat, including block fillers and primers, for each color and material to be applied. Use representative colors when preparing draw down for review.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Ready-mixed paints, both exterior and interior, varnish, stains, coatings, and waxes shall be first-line (best quality grade) retail products.
- B. Thinners and additives shall be of types recommended by the paint manufacturer.
- C. The use of lead-containing paint is not permitted.
- D. Products: Provide paint products by one of the following manufacturers:
 1. Benjamin Moore.
 2. ICI Dulux.
 3. Porter Paints.
 4. PPG Architectural Finishes, Inc.
 5. Pratt & Lambert.
 6. Sherwin-Williams.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which painting is to be applied. Do not proceed with painting work until unsatisfactory conditions have been corrected.

3.02 COLORS

- A. The Architect will select all colors and provide a schedule of colors and finishes. Colors shall closely match those indicated on Drawings. Refer to Section 09001 - FINISH AND MATERIAL SCHEDULE.
- B. Each coat of paint shall be applied in varying shades, with the final coat matching the approved color selected.

3.03 PREPARATION FOR PAINTING

- A. Surfaces to be painted shall be clean, smooth, free from scratches and dust and thoroughly dry. Wood surfaces shall be well sanded before painting work is started.

- B. Existing Wood Surfaces: Clean with a gentle pressure washing to remove all surface contaminants and paint not fully adhered to substrate. Any loose and scaling paint not removed by pressure washing shall be removed by wire brushing or other suitable power tool cleaning. Provide epoxy repairs and other remedial work to existing wood substrates as indicated on the Drawings.
 - 1. Clean a small test area as designated by the Architect prior to general wood surface cleaning to demonstrate cleaning methods. If, in the Architect's opinion, the cleaning methods are detrimental to wood surfaces, surface cleaning may be limited to hand washing with bristle brushes and deteriorated paint removal may be limited to hand scraping and hand sanding, as determined by the Architect.
- C. Concrete surfaces shall be cleaned, grouted, rubbed and pointed, water flushed clean and free of all dust, oily grease and laitance, and allowed to dry prior to painting.
- D. Steel and iron shall be free from grease, rust, scale and dust. Touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have heavy coating of scale, it shall be removed by wire brush or sand blasting necessary to produce a satisfactory surface for painting.

3.04 PROTECTION

- A. Adjacent fixtures and hardware shall be removed during the painting application.
- B. Particular care shall be taken by the use of clean drop cloths, masking and other suitable means, to protect adjoining surfaces, fixtures, and materials of all kinds. Painting applicator shall be held responsible for, and shall repair, all damages resulting from the painting operation.
- C. All ceiling and soffit overhead painting shall be applied only while the floor is completely and continuously covered with drop cloths.

3.05 APPLICATION

- A. Paints shall be applied in the colors and minimum number of coats scheduled herein and at the square foot coverage as stated in the paint manufacturer's printed specifications. It is intended that paint so applied shall cover to the satisfaction of the Architect or additional coats shall be applied until approval is obtained.
- B. Paints shall not be applied to surfaces which show a moisture content greater than 15 percent as determined by an electronic moisture meter.
- C. Paints shall not be applied when the temperature falls below 45 degrees F., in damp, rainy weather, or when the relative humidity exceeds 85 percent.
- D. Paint shall be evenly spread and well distributed. The finish coats shall be free from any noticeable laps, brush marks, streaks, runs, sags, wrinkles, and shiners.
- E. All wood surfaces shall be thoroughly sanded between coats as required for a flaw-free finish.

3.06 BACK PRIMING

- A. All wood surfaces (except pressure treated wood) to be placed against concrete or masonry substrates shall be painted with a sealer coat of paint or clear varnish before installation

3.07 TOUCH UP AND CLEANING

- A. Upon completion, all touching-up as required shall be applied and any paint shall be removed from all surfaces which are not specified to receive paint.

3.08 PAINTING OF PIPING FOR IDENTIFICATION

- A. Exposed piping, piping concealed in accessible pipe spaces and piping behind access panels shall be identified to designate service.
- B. Legend shall be stencil applied (painted on) at 40 feet spacing on straight runs where pipes pass through walls or floors and regulators, strainers, and clean-outs (except valves and fittings on plumbing fixtures and equipment).
- C. Legend shall give name in full or abbreviations. Size of stenciled identity lettering shall vary with the diameter of pipe covering as follows:
 - 1. Up to 1": 1/2" high letters.
 - 2. Over 1": 3/4" high letters.

3.09 PAINTING SCHEDULE

- A. The following surfaces shall be finished with the designated number of coats (in addition to shop or manufacturer's coats) with the respective designated products of Sherwin Williams (SW), or equivalent products by one of the other listed manufacturers, with a Dry Film Thickness (DFT) of not less than indicated:
- B. Trade names used are only to set a standard of quality desired.
- C. Omit primer on items with shop coat primer. All shop coats shall be touched up with the same kind of paint as the shop coat and allowed to dry before application of finish coats.
 - 1. Wood For Opaque Finish: Eggshell Finish. Apply and re-roll each coat of enamel to achieve uniform stipple.
 - a. 1 coat SW PrepRite Wall and Wood Primer: 1.9 DFT. Do not thin primer.
 - b. 2 coats SW ProMar 200 Interior Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 5.5 DFT.

2. Wood For Transparent Finish (Except Prefinished Wood): Polyurethane Natural Satin Finish. Sand between each coat.
 - a. 1 coat SW Wood Classics Stain. Custom stain.
 - b. 2 coats SW Wood Classics Waterborne Polyurethane Varnish: 0.8 - 1.0 DFT per coat.
 - c. Total 1.6 - 2.0 DFT.
3. Galvanized Metal: Eggshell Finish.
 - a. 1 coat SW Galvite HS Metal Primer: 3.0 - 4.5 DFT.
 - b. 2 coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 6.6 - 8.1 DFT.
4. Ferrous Metal: Eggshell Finish.
 - a. 1 coat SW All Surface Enamel Oil Primer: 2.5 DFT.
 - b. 2 coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 6.1 DFT.
5. Piping and Conduit - Exposed Surfaces: Semi-Gloss Finish.
 - a. Ferrous Metal:
 - (1) 1 coat SW All Surface Enamel Oil Primer: 2.5 DFT.
 - (2) 2 coats SW ProMar 200 Interior Alkyd Semi-Gloss Enamel: 1.7 DFT each coat.
 - (3) Total 5.9 DFT.
 - b. Aluminum and Galvanized Metal:
 - (1) 1 coat SW Galvite HS Metal Primer: 3.0 - 4.5 DFT.
 - (2) 2 coats SW ProMar 200 Interior Alkyd Semi-Gloss Enamel: 1.5 DFT each coat.
 - (3) Total 6.0 - 7.5 DFT.

6. Drywall: Eggshell Finish.
 - a. 1 coat SW PrepRite 200 Interior Latex Primer: 1.1 DFT.
 - b. 2 coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 4.7 DFT.
7. Masonry and Concrete: Eggshell Finish.
 - a. 1 coat SW PrepRite Block Filler: 8.0 DFT.
 - b. 2 coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 11.6 DFT
8. Veneer Plaster: Eggshell Finish.
 - a. 1 coat SW PrepRite 200 Interior Latex Primer: 1.1 DFT.
 - b. 2 coats SW ProMar 200 Alkyd Eg-Shel Enamel: 1.8 DFT each coat.
 - c. Total 4.7 DFT.

END OF SECTION 09900

DIVISION 10

SPECIALTIES

SECTION 10100 – VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Markerboards.
 - 2. Tackboards.
 - 3. Visual display conference units.

1.02 RELATED WORK

- A. PROJECTION SCREENS: Section 11132.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show location of panel joints.
 - 2. Include sections of typical trim members.
- C. Samples for Verification: For each type of visual display surface indicated and as follows:
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch-long sections of each trim profile.
- D. Maintenance Data: For visual display surfaces to include in maintenance manuals.
- E. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store visual display units vertically with packing materials between each unit.

1.06 WARRANTY

- A. Special Warranty for Porcelain Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces become slick or shiny.
 - c. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Porcelain Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain enamel coating fused to steel; uncoated thickness indicated.
- B. Hardboard: AHA A135.4, tempered.
- C. Particleboard: ANSI A208.1, Grade 1-M-1.
- D. Fiberboard: ANSI A208.2, Grade MD.
- E. Natural Cork Sheet: Seamless, single layer, compressed fine-grain cork sheet, bulletin board quality; face sanded for natural finish.
- F. Extruded Aluminum: ASTM B 221, Alloy 6063. Clear anodic finish.

2.02 MARKERBOARD ASSEMBLIES

- A. Porcelain Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021 inch thick, porcelain enamel face sheet with low gloss finish.
 - 1. Color: As selected by Architect from full range of industry colors.
- B. Manufacturers:
 - 1. Best-Rite Manufacturing.
 - 2. Claridge Products & Equipment, Inc.
 - 3. Marsh Industries, Inc.

- C. Particleboard Core: $\frac{1}{2}$ -inch thick; with 0.005 inch thick, aluminum foil backing.
- D. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.03 TACK ASSEMBLIES

- A. Manufacturers:
 - 1. Best-Rite Manufacturing.
 - 2. Claridge Products & Equipment, Inc.
 - 3. Marsh Industries, Inc.
- B. Natural Cork Tack Assembly: 1/4 inch thick, natural cork sheet factory laminated to 1/4 inch thick hardboard or particleboard backing.

2.04 VISUAL DISPLAY CONFERENCE UNITS

- A. Manufacturers:
 - 1. Best-Rite Manufacturing.
 - 2. Claridge Products & Equipment, Inc.
 - 3. Marsh Industries, Inc.
- B. Visual Display Conference Units: Factory-fabricated units consisting of hinged-door wood cabinet with perimeter face frame, sides, and back; not less than 3-inch interior depth and designed for surface wall mounting. Fabricate inside of cabinet and cabinet doors with fixed visual display surfaces.
 - 1. Wood Cabinets: Fabricate from solid wood with integral, solid wood markertray. Fabricate hinged door panels with solid wood frame and wood veneer exterior surface.
 - 2. Writing Surfaces: Provide manufacturer's standard porcelain enamel markerboards for use with erasable dry markers, mounted on inside back panel of unit.

2.05 ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062 inch thick extruded aluminum; of size and shape as indicated.
 - 1. Field Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.
 - 2. Factory Applied Trim: Manufacturer's standard.
- B. Chalktray: Manufacturer's standard continuous, solid extrusion-type aluminum chalktray with ribbed section and smoothly curved exposed ends.

2.06 FABRICATION

- A. Porcelain Enamel Visual Display Assemblies: Laminate porcelain enamel face sheet and backing sheet to core material under pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

2.07 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 complying with AAMA 611.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.
- B. Examine walls and partitions for proper backing for visual display surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.
- B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

3.03 INSTALLATION, GENERAL

- A. Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Field-Assembled Visual Display Units: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.

3.04 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. secure both top and bottom of boards to walls.
 - 1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.
 - a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.
- B. Visual Display Conference Units: Install units in locations and at mounting heights indicated on Drawings. Attach to wall surface as recommended by unit manufacturer.

3.05 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10100

SECTION 10160 – TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and install all solid polymer floor supported, overhead braced toilet partitions located in Toilet Rooms, all as indicated on Drawings or specified herein.

1.02 RELATED WORK

- A. GYPSUM WALLBOARD: Section 09250.
- B. TILE WORK: Section 09300.
- C. TOILET ACCESSORIES: Section 10800.

1.03 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation shall be performed only by a qualified installer with at least five (5) years documented experience in installations of a similar nature.
- B. Reference Standards: Comply with provisions of the following, unless otherwise indicated or specified:
 1. American Society for Testing and Materials (ASTM):
 - a. Referenced Standards.
 2. National Electrical Manufacturers Association (NEMA):
 - a. Referenced Standards.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation; including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Complete shop drawings shall be prepared for this work indicating the materials, sizes of members and units, construction and clearances required, and methods of securing to the building. Include instructions for installation of anchorage devices built into other work.
- C. Samples: Submit full range of color samples for each type of unit required. Submit 6-inch square samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.
- D. Installer Qualifications: Submit documented evidence of installer's qualifications.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver all units in substantial, protective cartons and with protective masking. Retain masking until completion of construction.
- B. Store all materials indoors. Locate and keep free from building contamination as might occur during the course of construction.
- C. Handle all materials carefully so as not to injure surface finishes. In the event of damage, immediately make all repairs and replacements necessary.

1.06 JOB CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting of work.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other related work to avoid delay.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Provide toilet partitions by one of the following manufacturers:
 - 1. Global Steel Products Corp.
 - 2. Metpar Corp.
 - 3. Santana Products, Inc.
 - 4. Sanymetal Products Company, Inc..

2.02 SOLID-POLYMER TOILET PARTITIONS

- A. Door, Panel, and Pilaster Construction: Solid, polypropylene (PP) panel material, not less than 1-inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns.
- B. Pilaster Shoes: ASTM A 666, Type 302/304 stainless steel, not less than 3-inches high, 20 gauge, finished to match hardware.
- C. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated non-ferrous cast zinc alloy ("Zamac") or clear anodized aluminum.

D. Heat-Sink Strip: Manufacturer's standard continuous, extruded aluminum strip fastened to exposed bottom edges of solid polymer components to prevent burning.

2.03 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of chromium-plated non-ferrous cast alloy ("Zamac").
- B. Overhead Bracing: manufacturer's standard continuous, extruded aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.04 FABRICATION

- A. Overhead Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Doors: Unless otherwise indicated, provide 24 inch wide in-swinging doors for standard toilet compartment and 36 inch wide out-swinging doors with a minimum 32 inch wide clear opening for compartment indicated to be accessible to people with disabilities.
 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 2. Latch and Keeper: Recessed latch unit, designed for emergency access, with combination rubberfaced door strike and keeper. Use model complying with requirements of ADA.
 3. Coat Hook: Manufacturer's standard combination chrome-plated hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearances of not more than 1/2-inch between pilasters and panels, and not more than 1-inch between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.
- B. Overhead Braced Partitions: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.
- C. Accessories: Coordinate accessories' mounting with other trades. Refer to Section 10800 - TOILET ROOM ACCESSORIES.

3.02 ADJUST AND CLEAN

- A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. At handicap accessible stall adjust door for ADA requirements.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period. Replace surfaces that become scarred or chipped prior to Owner's acceptance.

END OF SECTION 10160

SECTION 10425 – SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Signs exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Signage to complete this Project. Refer to Section 01020 – OWNER’S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Signage materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of Signage is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes panel-type signs.
- C. The extent of signs includes one (1) each for all floors as indicated on the Finish Schedule Drawings; note that abbreviated names to be spelled out in full. Signs shall include both names and numbers. Panel signs shall be wall mounted and include braille for both name and number. Graphic accessible symbols shall be added to all Toilet Room signs and Shower Room signs.

1.02 SUBMITTALS

- A. Schedule of Flush Signage: Submit schedule of all Signage including a breakdown of signs supplied from Owner’s existing inventory.
- B. Product Data: For each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop Drawings: Showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
- D. Samples: For verification of color, pattern, and texture selected, and compliance with requirements indicated:
 - 1. Plastic Laminate: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.03 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source of a single manufacturer.

1.04 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on approved shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Andco Industries Corp.
 2. APCO Graphics, Inc.
 3. ASI Sign Systems, Inc.
 4. Best Manufacturing Company.
 5. Mohawk Sign Systems.
 6. Vomar Products, Inc.

2.02 MATERIALS

- A. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated, or, if not indicated, as selected from the manufacturer's standards.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

2.03 PANEL SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth, even level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
- B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:
 - 1. Edge Condition: Beveled.
 - 2. Edge Color for Plastic Laminate: Edge color same as background.
 - 3. Corner Condition: Square corners.
- C. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
- D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- E. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.
 - 1. Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply.
 - a. ADA Compliance: Engrave the copy to produce a minimum indentation depth of 1/32 inch and a minimum stroke width of 1/4 inch.

2.04 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces as recommended by sign manufacturer for particular installation substrate.

3.02 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10425

SECTION 10505 – METAL LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Metal Lockers exists on the Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Metal Lockers to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Metal Lockers used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Metal Lockers is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes the following:
 - 1. Single-tier, full height wardrobe lockers.

1.02 RELATED WORK

- A. TOILET COMPARTMENTS: Section 10160.
- B. TOILET ACCESSORIES: Section 10800.

1.03 SUBMITTALS

- A. Schedule of Metal Lockers: Submit schedule of all Metal Lockers including a breakdown of lockers supplied from Owner's existing inventory.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
 - 1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.

D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare samples from the same material to be used for the Work.

1. Lockers.

E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms shall be included in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.

B. Protect lockers from damage during delivery, handling, storage, and installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Interior/Medart.
2. List Industries, Inc.
3. Lyon Metal Products, Inc.
4. Penco Products, Inc.; Subsidiary of Vesper Corporation.
5. Republic Storage Systems Co., Inc.

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 366, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Fasteners: Zinc, or nickel-plated steel, slotless type exposed bolt heads, self-locking nuts or lock washers for nuts on moving parts.

2.03 WARDROBE LOCKERS

- A. Body: Form backs, tops, bottoms, sides, and intermediate partitions from steel sheet; flanged for double thickness at back vertical corners. Comply with the following:
 - 1. Back-Material Sheet Thickness: 0.0478 inch.
 - 2. Side-Material Sheet Thickness: 0.0478 inch.
 - 3. Exposed Ends: Form exposed ends of nonrecessed lockers from minimum 0.0598 inch.
- B. Frames: Form channel frames from minimum 0.0598 inch thick steel sheet; lapped and welded at corners. Form continuous integral door strike on vertical frame members. Provide resilient bumpers to cushion door closing.
 - 1. Latch Hooks: Form from minimum 0.1046 inch thick steel; welded or riveted to door frames.
 - 2. Cross Frames: Form intermediate channel cross frames between tiers from minimum 0.0598 inch thick steel sheet. Weld to vertical frame members.
 - 3. Frame Vents: Fabricate vertical face frames with vents.
- C. Doors: One-piece steel sheet, formed into channel shape at vertical edges and flanged at right angles at top and bottom edges. Fabricate to prevent springing when opening or closing, and to swing 180 degrees. Comply with the following:
 - 1. Sheet Thickness: 0.0598 inch minimum.
 - 2. Reinforcement: Brace or reinforce inner face of doors over 15 inches wide.
 - 3. Reinforcing and Sound-Dampening Panels: Brace or reinforce inner face of doors with manufacturer's standard reinforcing angles, channels, or stiffener panels.
 - 4. Acoustical Treatment: Fabricate lockers for quiet operation with manufacturer's standard rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact.
 - 5. Louvered Vents: Stamped, louvered vents in door face, as follows:
 - a. Single-Tier Lockers: No fewer than six louver openings top and bottom.

- D. Hinges: Steel, full-loop, five or seven knuckle; tight pin; minimum 2 inches high. Weld to inside of door frame and attach to door with at least two factory-installed fasteners that are completely concealed and tamper resistant when door is closed.
 - 1. Provide at least three hinges for each door.
- E. Recessed Handle and Latch: Manufacturer's standard housing, formed from 0.0359 inch thick nickel-plated steel or stainless steel, with integral door pull, recessed for latch lifter and locking devices; nonprotruding latch lifter; and automatic, prelocking, pry-resistant latch, as follows:
 - 1. Provide minimum three-point latching for each door.

2.04 LOCKS

- A. Fabricate lockers to receive the following locking devices, installed on lockers using security-type fasteners:
 - 1. Built-In Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key. Comply with the following:
 - a. Bolt Operation: Automatically locking dead bolt.

2.05 LOCKER ACCESSORIES

- A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:
 - 1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for -, double-tier units. Attach hooks with at least two fasteners.
 - 2. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - 3. Shelves: Full height lockers shall have one shelf.
- B. Continuous Metal Base: Minimum 0.0598 thick steel sheet, channel or zee profiled for stiffness, fabricated in lengths as long as practicable to enclose base and base ends of lockers, and finished to match lockers.
 - 1. Height: 4 inches.

- C. Continuous Sloping Tops: Manufacturer's standard, fabricated from minimum 0.0359 inch thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
 - 1. Closures: Hipped-end type.
- D. Recess Trim: Manufacturer's standard; fabricated from minimum 0.0478 inch thick steel sheet, minimum 2-1/2 inch face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.
- E. Filler Panels: Manufacturer's standard; fabricated from minimum 0.0478 inch thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.
- F. Finished End Panels: Manufacturer's standard; fabricated from minimum 0.0239 inch steel sheet, finished to match lockers, and designed for concealing exposed ends of nonrecessed lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.06 FABRICATION

- A. Unit Principle: Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.
- B. Knocked-Down Construction: Fabricate lockers for nominal assembly at Project site.
- C. All-Welded Construction: Preassemble lockers by welding all joints, seams, and connections, with no bolts, screws, or rivets used in assembly. Grind exposed welds flush.
- D. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece assembly.
 - 1. Form locker body panels, doors, shelves, and accessories from one-piece steel sheet, unless otherwise indicated.

2.07 FINISHES, GENERAL

- A. Finish all steel surfaces and accessories, except prefinished stainless steel and chrome-plated surfaces.
- B. Comply with NAAMM "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- C. Protect mechanical finishes on exposed surfaces from damage by applying a stripable, temporary protective covering before shipping.
- D. 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 they are assembled or installed to minimize contrast.

2.08 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.
- B. Baked Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 1.4 mils on doors, frames, and legs, and 1.1 mils elsewhere.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine concrete bases for suitable conditions where metal lockers are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.
- B. Assemble knocked-down lockers with standard fasteners, with no exposed fasteners on door faces and face frames.
- C. Connect groups of all-welded lockers together with standard fasteners, with no exposed fasteners on face frames.
- D. Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

- E. Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed lockers with concealed clips.
 - 2. Attach sloping top units to lockers, with closures at exposed ends.
- F. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed lockers.
- H. Anchor locker benches to floors. Uniformly space pedestals not more than 72 inches apart, and securely fasten to bench top and anchor to floor.

3.03 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
- B. Clean interior and exposed exterior surfaces and polish stainless steel and nonferrous metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. Touch up marred finishes, or replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10505

SECTION 10520 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work of this Section shall include the following fire protection specialties and as indicated on the Drawings:

1. Fire Extinguishers.
2. Cabinets.
3. Brackets.
4. Accessories.

1.02 RELATED WORK

A. GYPSUM WALLBOARD: Section 09250.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with requirements of the following, unless otherwise indicated or specified:

1. National Fire Protection Association (NFPA):
 - a. NFPA 10 - Portable Fire Extinguishers.

B. Single Source Responsibility: Provide fire extinguishers, cabinets, brackets, and accessories by single manufacturer.

C. Requirements of Regulatory Agencies: All fire extinguishers shall be Underwriters' Laboratories (UL) approved and labeled.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for fire extinguishers and accessories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products: Provide fire extinguishers, cabinets, and accessories by one of the following manufacturers:

1. J.L. Industries, Inc.
2. Larsen's Manufacturing Co.
3. Potter-Roemer.

2.02 FIRE EXTINGUISHERS

- A. Fire extinguishers shall be multi-purpose, dry chemical type.
- B. Products: Provide one of the following fire extinguishers:
 - 1. "MP 10"; Larsen's Manufacturing Co.
 - 2. "Cosmic 10E"; J.L. Industries, Inc.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire extinguisher cabinets shall be used for finished areas, types as follows:
 - 1. Semi-Recessed (Interior): Provide one of the following cabinets:
 - a. "Architectural Series 2409-6R Full Glass, Acrylic", baked enamel finish; Larsen's Manufacturing Co.
 - b. "Ambassador Series 1017 F 12", baked enamel finish; J.L. Industries, Inc.
 - 2. Color to be selected by Architect from manufacturer's standard line.
- B. Brackets shall be used for all utility/service areas. For interior installations, provide Larsen's "#5525" or equivalent.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify servicing, charging, and tagging of all fire extinguishers.

3.02 INSTALLATION

- A. Install the items of this Section in strict accordance with the original design, approved Shop Drawings, NFPA 10, and requirements of agencies having jurisdiction, as approved by the Architect, anchoring all components firmly into position.

END OF SECTION 10520

SECTION 10800 – TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide all toilet accessories as indicated on the Drawings and herein specified.
- B. Refer to Drawings for listing of accessories.

1.02 RELATED WORK

- A. COLD FORMED METAL FRAMING: Section 05400.
- B. GLASS AND GLAZING: Section 08800.
- C. GYPSUM WALLBOARD: Section 09250.
- D. TILE WORK: Section 09300.
- E. TOILET COMPARTMENTS: Section 10160.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
- B. Codes and Regulations: Comply with requirements of the Florida Building Code.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information, catalog cuts, and installation instructions for each product to be furnished and installed.
- B. Warranty: Submit manufacturer's standard 10 year warranty for mirror glass against silver spoiling.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Materials shall be delivered to Site undamaged. Materials shall be stored on the site in an area and in a manner to provide protection from damage until incorporated in the Work.

1.06 JOB CONDITIONS

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in metal framed or masonry walls; coordinate delivery with other work to avoid delay.

B. Accessory Locations:

1. Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
2. Locations shall comply with State and Federal handicapped accessibility requirements for handicapped accessible units.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products: Model numbers shown for accessories are units manufactured by Bobrick Washroom Equipment Company, Inc., unless otherwise specified. Provide products by Bobrick or by one of the following manufacturers:

1. A&J Washroom Accessories.
2. American Specialties Inc.
3. Bradley Corp.

2.02 MATERIALS, GENERAL

- A. Stainless Steel: ASTM A 666 Type 304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.
- B. Mirror Glass: ASTM C 0148, Type I, Class 1, Quality q2, 1/4 inch thick, with silvering, copper coating, and protective organic coating complying with FS DD-M-411. Polished edge, fully protected with padding.
- C. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed, theft and vandal resistant.

2.03 FABRICATION

- A. General: Stamped names or labels on exposed faces of toilet accessory units are NOT permitted. Where locks are required for a particular type of toilet accessory, provide same keying throughout Project. Furnish two (2) keys for each lock.
- B. Recessed Toilet Accessories: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with continuous stainless steel piano hinges. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install toilet accessories in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.02 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

3.03 TOILET ACCESSORY SCHEDULE

- A. Refer to Drawings for the toilet accessory schedule.

END OF SECTION 10800

SECTION 10900 – MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Types of miscellaneous specialties required include:
 1. Metal Shelving.
 2. Walk-Off Mat.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for all items specified herein.
- B. Shop Drawings: Submit shop drawings showing complete fabrication and installation details for all items specified herein.
- C. Samples: As may be requested by Architect.

PART 2 - PRODUCTS

2.01 METAL SHELVING

- A. Description: Heavy duty steel open-unit type shelving with baked enamel finish. Complete with adjustable clip shelf supports, integral base, and closed ends.
- B. Manufacturers: Penco or Lyon Metal.

2.02 WALK-OFF MAT

- A. Description: Rubber mat with integral carpet and rib design in size and thickness as indicated on Drawings. Terminates as butt joint with adjacent ceramic floor tile substrates. Complete with manufacturer's standard accessories. Mat color and carpet insert color selections by Architect from manufacturer's full product line.
- B. Basis of Design: "Floor Keeper Entrance Barrier Matting"; Johnsonite Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all miscellaneous specialties in accordance with applicable standards, manufacturer's published instructions and current recommendations, and approved shop drawings.

END OF SECTION 10900

DIVISION 11

EQUIPMENT

SECTION 11132 – PROJECTION SCREENS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Front projection screens.

1.02 RELATED WORK

- A. VISUAL DISPLAY BOARDS: Section 10100.
- B. DIVISION 16 Sections for electrical service and connections, including metal device boxes for switches.

1.03 DEFINITIONS

- A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface, to the most central position on perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.04 SUBMITTALS

- A. Product Data: For each type of screen specified.
- B. Shop Drawings: Show layouts and types of projection screens. Include the following:
 - 1. Location of screen centerline relative to ends of screen case.
 - 2. Location of wiring connections.
 - 3. Location of seams in viewing surfaces.
 - 4. Connections to suspension systems for pendant- and recess-mounted screens.
 - 5. Anchorage details.
 - 6. Details of juncture of exposed surfaces with adjacent finishes.
 - 7. Frame details.
 - 8. Accessories.
 - 9. Wiring Diagrams.
- C. Maintenance Data: For projection screens to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain projection screens through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.
- 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.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to take place.
- B. Store rear projection screens as recommended in manufacturer's written instructions and in manufacturer's protective packages until time of installation.
- C. Protect surfaces of rear projection screens from damage due to abrasion, dust, and other conditions.

1.07 COORDINATION

- A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling framing, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.01 FRONT PROJECTION SCREENS

- A. Electrically Operated Screens, General: Provide manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Low-Voltage Control: System consisting of a control unit with 24-V power supply, remote 3-button or 3-position switches, and interconnecting wiring. Switches are installed in recessed metal device boxes with flush cover plates matching other electrical device cover plates in room where switch is installed.
 - a. Provide infrared remote control consisting of battery-powered transmitter and receiver for use with low-voltage control system.

2. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8 inch diameter, metal rod with ends of rod protected by plastic caps.
 - a. Roller for motor in roller supported by vibration- and noise-absorbing supports.

B. Suspended, Electrically Operated Screens: Motor in roller units designed and fabricated for suspended mounting.

1. Products:
 - a. "Advantage Electrol"; Da-Lite Screen Co., Inc.
 - b. "Paragon"; Draper Inc.
 - c. "Model A-B"; Stewart Filmscreen Corporation.
2. Provide metal or metal-lined wiring compartment on units with motor in roller.
3. Screen Case: Made from metal, factory primed.

C. Screen Material and Viewing Surface:

1. Matte-White Viewing Surface: Peak gain of 0.9 to 1.0, and gain of not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
2. Products:
 - a. "Matte White"; Bretford Manufacturing, Inc.
 - b. "Da-Mat"; Da-Lite Screen Co., Inc.
 - c. "Fiberglass Matte White"; Draper Inc.
3. Material: Vinyl-Coated glass-fiber fabric.
4. Mildew Resistance: Rating of 0 or 1 when tested according to ASTM G 21.
5. Flame Resistance: Passes NFPA 701.

6. Seamless Construction: Provide screens, in sizes indicated, without seams.
7. Edge Treatment: Black masking borders.
8. Size of Viewing Surface: As indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install projection screens at locations indicated to comply with screen manufacturer's written instructions.
- B. Install front projection screens with screen cases in position and relationship to adjoining construction indicated. Securely anchor to supporting substrate in manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
 1. Install low-voltage controls according to NFPA 70 and manufacturer's written instructions.
 - a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 2. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.
 3. Test manually operated units to verify that screen operating components are in optimum functioning condition.

3.02 PROTECTION AND CLEANING

- A. After installation, protect projection screens from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 11132

DIVISION 12

FURNISHINGS

SECTION 12345 – STEEL LABORATORY CASEWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – A large inventory of Steel Laboratory Casework exists on Project and is currently in storage. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Steel Laboratory Casework to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Additional Steel Laboratory Casework materials used to complete this Work, as applicable, shall match existing inventory in manufacture, type, style, and color.
 - 3. Installation of ALL Steel Laboratory Casework is included under the Work of this Section whether using existing inventory or newly furnished.
- B. Section includes steel laboratory casework as indicated on Drawings and specified herein. Provide all cabinets and casework, including tops, ledges, supporting structures, pipe enclosures, and miscellaneous items of equipment as listed in this Specification, or equipment schedules, including delivery to the building, setting in place, leveling, scribing to walls and floors as required. Furnishing and installing all filler panels, knee space panels and scribes as shown on drawings.
- C. Furnishing and delivering all utility service outlet accessory fittings, electrical receptacles and switches, as listed in these specifications, equipment schedules or as shown on drawings as mounted on the laboratory furniture. The above-defined items shall be furnished with supply tank nipples and lock nuts, loose in boxes and properly marked. All plumbing and electrical fittings will be packaged separately and properly marked for delivery to the appropriate contractor.
- D. Furnishing and delivering, packed in boxes for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor, and where these items are part of the equipment or listed in the specifications, equipment schedules or shown on the drawings. Integral tailpieces when required shall be in accordance with the manufacturer's standards. All tailpieces shall be furnished less the couplings required to connect them to the drain piping system.
- E. Furnishing service strip supports where specified, and setting in place service tunnels, service turrets, supporting structures and reagent racks of the type shown on the details.

1.02 RELATED WORK

- A. OWNER'S ALLOWANCE: Section 01020.
- B. ROUGH CARPENTRY: Section 06100.
- C. Division 15 - MECHANICAL Sections.
- D. Division 16 - ELECTRICAL Sections.

1.03 REFERENCE STANDARDS

- A. SEFA 3 - Scientific Equipment and Furniture Association.
- B. SEFA 8 - Scientific Equipment and Furniture Association
- C. NFPA 30 - National Fire Protection Association
- D. NFPA-45 - National Fire Protection Association
- E. UL - Underwriters Laboratories
- F. ASTM D552 - Bending Test

1.04 QUALITY ASSURANCE

- A. The steel laboratory furniture contractor shall also provide work tops and fume hoods all manufactured or shipped from the same geographic location to assure proper staging, shipment and single source responsibility.
- B. General Performance: Provide certification that furniture shall meet the performance requirements described in SEFA 8.

1.05 SUBMITTALS

- A. Schedule of Steel Laboratory Casework: Submit schedule of all Steel Laboratory Casework including a breakdown of casework supplied from Owner's existing inventory.
- B. Manufacturer's Data: Submit manufacturer's data and installation instructions for each type of casework. Provide data indicating compliance with SEFA Standard#8.
- C. Samples: Samples from non-specified manufacturers will be required and reviewed per specification. Samples shall be delivered, at no cost to the Owner to a destination set forth by the Architect and/or Owner. This must be performed seven (7) days before quotation deadline as a condition of approval of each bidder. Samples shall be full size, production type samples. Miniature, or "Show Room" type samples are not acceptable. Furnish the following:
 1. One combination drawer and cupboard base unit showing complete construction details, including one shelf.
 2. One sample of all top materials shown or called for, of sufficient size to perform finish requirement tests.
 3. Sample of all mechanical service fittings, locks, door pulls, hinges, and interior hardware.

D. Shop Drawings: Submit shop drawings for furniture assemblies showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fittings.

1. Coordinate shop drawings with other work involved.
2. Provide roughing-in drawings for mechanical and electrical services when required.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The basis of this specification is steel casework manufactured according to the standards used by Kewaunee Scientific Corporation, 2700 Front Street, Statesville, North Carolina. The specified design is "Research Collection - Advantage - Style 02."

2.02 MATERIALS

A. General Requirements: It is the intent of this specification to provide a high quality steel cabinet specifically designed for the laboratory environment. The cabinet is to be flush face construction, with doors and drawers in the same plane as the cabinet face frame, without overlap. The door and drawers are to be 3/4" thick with square edges, and a recessed aluminum pull.

B. Sheet Steel: Cold rolled sheet steel shall be prime grade; roller leveled, and shall be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects. All gauges shall be U.S. Standard.

C. Glass: Glass used for framed sliding and swinging doors shall be 1/8" float glass. Glass used for unframed sliding doors, shall be 1/4" float glass. Glass used in fume hoods or other hazardous locations shall be 7/32" laminated safety float glass, except the glass shielding fluorescent lights in fume hoods shall be tempered glass to provide greater resistance to heat and impact.

D. Hardware and Trim:

1. Drawer and Door Pulls: Drawer and door pulls shall be brushed aluminum recessed style. All pulls shall be satin finish aluminum, with clear, lacquer finish. Two pulls shall be required on all drawers over 24" long. Use of plastic pulls (molded or extruded), or a design not compatible for usage by the handicapped will not be acceptable.
2. Sliding Door Pulls: Flush pulls for sliding doors shall be brushed aluminum, providing a recessed finger grip. Finger holes or slots machined into doors will not be acceptable.

3. Hinges: Hinges shall be made of Type 304 stainless steel .089 thick, 2-1/2" high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors under 36" in height shall be hung on one pair of hinges, and doors over 36" high shall be hung on 3 hinges.
4. Locks: Locks, where shown or called for, shall be a National Lock, 5-disc tumbler with heavy duty interchangeable cylinder. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers. Locks shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non-interchangeable master key groups.
5. Roller Catches: Roller catches for doors shall be nylon roller type, adjustable, with plated strike.
6. Elbow Catches: Elbow catches and strike plates shall be used on left hand doors of double door cases where locks are used, and are to be burnished cast aluminum, with bright brass finish.
7. Shelf Adjustment Clips: Shelf adjustment clips shall be nickel-plated steel.
8. Leg Shoes: Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be a pliable, black vinyl material. Use of a leg shoe which does not conceal leveling device will not be acceptable.
9. Base Molding: Base molding shall be provided by others.
10. Support Rods, Upright Rod Assemblies and Rod Sockets: Upright rods, cross rods and ring support rods, where specified, shall be anodized Duralumin (2" or 3/4" dia., as required). Rod sockets shall be chrome plated brass, secured through table tops with lock nut and spring washer. Rod clamps shall be heavy duty, designed to securely hold rod assembly in any position. Use of wood rod assemblies will not be accepted.
11. Label Holders: Label holders, where shown or called for, shall be self adhesive type aluminum with satin finish and designed for 2-1/2" x 1-1/8" cards, unless otherwise specified.
12. Number Plates: Number plates, where shown or called for, shall be self adhesive type aluminum with indented black lettering.
13. Sink Supports: Sink supports shall be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear top rails. Two 3/4" x 1-2/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports shall be suspended from full-length reinforcements welded to the two end rails. Two 1" x 2" x 10 gauge full-length channels shall be hung from the four 1/4" dia. rods to provide an alternate sink cradle.

14. Support Struts: Support struts shall consist of two 16 gauge channel uprights fastened top and bottom by two adjustable "U" shaped spreaders, each 12 gauge, 1-1/2" x length required. Struts shall be furnished to support drain troughs, and to support work top at plumbing space under fume hood superstructures or other heavy loads. Support struts can be furnished with hangers at extra cost when specified, to support mechanical service piping and drain lines.
15. Pipe Enclosures: Pipe enclosures shall be either wall or center type as required and constructed from cold rolled steel painted to match cabinets. Pipe enclosures shall conceal vertical service lines coming down from the ceiling to the work surface. One side shall be removable for easy access with no exposed fasteners.

2.03 CONSTRUCTION

- A. General:
 1. The steel furniture shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry. First class quality casework shall be insured by the use of proper machinery, tools, dies, fixtures and skilled workmanship to meet the intended quality and quantity for the project.
 2. All cabinets shall be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap. Exterior corners shall be spot welded with heavy back up reinforcement at exterior corners. All face joints shall be welded and ground smooth to provide a continuous flat plane.
 3. Each cabinets shall be complete so that units can be relocated at any subsequent time without requiring field application of finished ends or other such parts.
 4. Case openings shall be rabbeted on all four sides for both hinged and sliding doors to provide a dust resistant case.
 5. All cabinets shall have a cleanable smooth interior. Bottom shall be the pan type with both sides and back formed up for easy cleaning. Bottoms with pans turned down must be caulked around inside perimeter.
- B. Steel Gauges: Gauges of steel used in construction of cases shall be 18 gauge, except as follows:
 1. Corner gussets for leveling bolts and apron corner braces, 12 gauge.
 2. Hinge reinforcements, case and drawer suspension channels, 14 gauge.
 3. Top and intermediate front horizontal rails, table aprons and reinforcement gussets, 16 gauge.
 4. Drawer assemblies, door assemblies and adjustable shelves, 20 gauge.

C. Base Cabinets:

1. End uprights shall be formed into not less than a channel formation at top, bottom, back and front. The front edge shall further offset to form a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws. An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning. The upright filler shall be perforated with shelf adjustment holes at not more than 2" centers painted prior to assembly. The inside front of the upright shall be further reinforced with a full height 14 gauge hinge reinforcement angle.
2. Top horizontal rail on base cabinets shall interlock within the flange at top of end panels for strength, but shall be flush as face of unit. Top rail shall have a full width rabbet for swinging doors and drawers. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.
3. Intermediate rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.
4. Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.
5. Cabinet bottom, and bottom rail shall be formed of one piece of steel except in corner units and shall have both sides and back formed up with a radius between flange and bottom to provide for ease of cleaning, and shall be offset in front to provide a door and drawer recess rabbet.
6. Toe space rail shall extend up and forward to engage bottom rail to form a smooth surfaced fully enclosed toe space, 3" deep x 5" high. Whenever toe space base is omitted for units to set on building bases on separate steel bases, then the toe space rail shall extend back 4-1/2".
7. Back construction shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, open for access to plumbing lines. Cupboard units only shall be provided with removable back panels.
8. Die formed gussets shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8"-16 leveling bolt, 3" long, shall engage a clinch nut in each gusset. Access to the leveling bolts shall be through plug buttons in the bottom pan. Each leveling bolt and gusset shall be capable of supporting 500 lbs. (Each unit shall support 2000 lbs. uniformly distributed on a work top). Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.

9. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
10. Drawer assembly shall consist of an outer head and a drawer body. The outer head shall have a channel formation on all four sides to eliminate sharp raw edges of steel and the top front corners shall be welded and ground smooth. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation at the top of the outer drawer head providing a 3/4" thick drawer head. All drawer heads shall contain a sound deadening material.
11. Door assembly (two-piece) for solid pan swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed into a channel or flanged shape at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contain a structural foam sound deadening material.
12. Drawer/door assemblies shall be painted prior to assembly. Both shall be punched for attaching drawer pulls. Likewise, inner pan formation of door and drawer body shall be indented for in-field installation of locks when required.
13. Drawer suspension assembly shall consist of 2 sections providing a quiet, smooth operation on ball bearing nylon rollers. All drawers shall be self-closing from a point 5" open. Cabinet channels shall maintain alignment of drawer and provide an integral drawer stop, but the drawer shall be removable without the use of tools. Drawers shall provide 13-5/8" front to back clearance when fully extended. Drawers shall rise when opened thus avoiding friction with lower drawers and/or doors. Drawer suspension system shall incorporate a double stop, lock open feature.
14. Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.
15. Knee space panels, where shown or specified, shall be 18 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

D. Special Purpose Storage Cabinets:

1. Acid Storage Fume Hood Cabinets: Acid storage fume hood cabinets shall utilize the same gauges of steel and construction features as other base cabinets except they shall be completely lined with a one piece Polyethylene corrosion resistant liner. The liner shall be 1/4" thick, molded into a seamless tub, including top, sides and bottom, with a 1" lip at the bottom front to contain spills. Each door shall have a set of louvers at the top and bottom, and have a 1/8" sheet polyethylene liner. Where specified, each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe. It should provide a positive airflow directly into the fume hood exhaust system.
2. Solvent Storage Cabinets: Solvent storage cabinets shall be specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UFC, OSHA and NFPA No. 30 - 1993, and cabinets shall be UL approved and labeled. The bottoms, top, sides and doors shall be fabricated of 18" gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A full-depth adjustable shelf is also provided. The shelf is perforated to allow air circulation within the cabinet. Two diametrically opposed vents with spark screens are provided in the back of the cabinet as well as a grounding screw. The cabinet shall have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE - KEEP FIRE AWAY".

E. Steel Sliding Door Upper Cabinet Construction:

1. Sliding door storage cabinets shall have a completely finished interior same as exterior. Doors shall be suspended from the top by nylon rollers in a roll formed steel track welded to top of cabinet. Track shall be so designed to prevent accidental removal of doors in operation position.
2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front fascia of upright shall be 1" wide with inside edge formed in channel 2" x 1/4". A full height box reinforcement shall be fitted to the channel, formed to provide a recessed strike for door and to reinforce the case. The back side of the reinforcement shall be perforated with shelf adjustment holes spaced at not more than 1" centers. The back of upright shall be formed to a 2-1/2" formation. A 14-gauge hinge reinforcement same as specified for base units shall be welded to inner side of front uprights.

3. Cabinet tops shall be formed with a 1-1/2" wide front fascia, and a 2" x 2" channel formation at front edge flanged down and back. Door suspension roll formed steel track shall be welded to cabinet top.
4. Cabinet flush bottoms shall be formed with a 1" wide front fascia, and a channel formation at front edge flanged back and up to create a door recess rabbet for dust stop.
5. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be set in a channel formation in cabinet back and enclosed by end uprights.
6. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
7. Glazed sliding doors shall be suspended from the top in a roll formed steel track welded to cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors. Doors shall be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Doors shall be glazed with 1/8" float glass, held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be pierced for a recessed flush pull, as described under HARDWARE.
8. Solid panel sliding doors shall be suspended same as glazed sliding doors. Door assembly (two-piece) shall consist of inner and outer pan formations, mechanically assembled after painting (electrodeposition). All doors shall be 3/4" thick and contain a structural foam sound deadening material.
9. Sliding plate glass doors shall be available for 48" high cases and under. The plate glass doors shall operate on an extruded aluminum track at the bottom of the cabinet, and in an extruded aluminum channel at the top. The bottom of each glass door shall be furnished with a continuous aluminum shoe the full length of the door, which shall be equipped with two nylon rollers that operate on the extruded aluminum track. The aluminum shoes on the bottom of the plate glass doors shall be equipped with pulls for operation of the doors, and also to prevent bypassing of the doors. Plate glass doors shall close against rubber bumpers.

F. Steel Swinging Door Upper Cabinet Construction:

1. Swinging door storage cabinets shall have a completely finished interior same as exterior.

2. End uprights shall be formed at the front in a 1" channel formation with the inside flange formed to provide a 31/32" x 1/2" door recess. The back of the upright shall be formed to a 2-1/2" formation. A 14 gauge hinge reinforcement, same as specified for BASE CABINETS, shall be welded to inner side of front uprights.
3. Cabinet tops shall be formed into a 1" x 1-3/16" channel shape at front, with a 31/32" x 1/2" offset for door recess, and with flange at rear and sides for electro-welding cabinet top to cabinet back and ends.
4. Cabinet flush bottoms shall be formed with a 1" wide front fascia and a 13/16" channel shape formation at front edge flanged back and up to create a door recess rabbet for dust stop.
5. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be set in a channel formation in cabinet back and enclosed by end uprights.
6. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
7. Glazed swinging doors shall be 3/4" thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 14 gauge hinge reinforcements welded in place. Doors shall be glazed with 1/8" float glass, held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be pierced for a recessed flush pull, as described under HARDWARE.
8. Door assembly (two-piece) for solid panel swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed into a channel or flanged shape at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contain a structural foam sound deadening material.

G. Steel Sliding Door Full Height Cabinet Construction:

1. Sliding door full height storage cabinets shall have a completely finished interior same as exterior. Doors shall be suspended from the top by nylon rollers in a roll formed steel track welded to top of cabinet. Track shall be so designed to prevent accidental removal of doors in operating position.

2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front fascia of upright shall be 1-1/4" wide with inside edge formed in a channel $\frac{1}{2}$ " x 3/8". A full height box reinforcement shall be fitted to the channel, formed to provide a recessed strike for door and to reinforce the cabinet. The back side of the reinforcement shall be perforated with shelf adjustment holes spaced at not more than 1" centers. Back of upright shall be formed in a 2-1/2" formation. 14 gauge hinge reinforcement same as specified for base cabinets shall be welded to inner side of front uprights.
3. Cabinet tops shall be formed in a channel shape at front with a 13/16" wide, front fascia, and a 31/32" x 1/2" channel formation at bottom and back edge flanged down. Front fascia channel shall be strengthened with an electro-weld reinforcement. Door suspension system shall be mechanically fastened to reinforcement.
4. Cabinet bottoms for storage cabinets shall have both sides and back formed up with a radius between flange and bottom to provide ease of cleaning, and shall be offset in front to provide a door recess rabbet for dust stop. Cabinet bottoms shall be formed to provide a flush 1" face rail with a return flange to give a 9/16" deep x 5" high toe space.
5. Toe space rails shall interlock in back of bottom rail and with end panel to provide a welding plate, and shall extend to the floor with a flange turned back 1-1/2" and turned up 3/8" for support.
6. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be enclosed by a formation in cabinet back and enclosed by end uprights.
7. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation electro-welded to underside of shelf.
8. Glazed sliding doors shall be suspended from the top in a roll formed steel track welded to cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors. Doors shall be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Doors shall be glazed with 1/8" float glass, held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be pierced for a recessed flush pull, as described under HARDWARE.

9. Solid panel sliding doors shall be suspended same as glazed sliding doors. Door assembly (two-piece) shall consist of inner and outer pan formations mechanically assembled after painting. All full height solid panel doors shall be further reinforced by a full-height channel formation welded to inner pan. Doors shall be 3/4" thick and contain structural foam sound deadening material.

H. Steel Swinging Door Full Height Cabinet Construction:

1. Swinging door full height storage cabinets shall have a completely finished interior same as exterior.
2. End uprights shall be formed at the front in a 1" channel formation with the inside flange formed to provide a 31/32" x 1/2" door recess. The back of the upright shall be formed to a 2-1/2" formation. A 14-gauge hinge reinforcement, same as specified for BASE CABINETS, shall be welded to inner side of front uprights.
3. Cabinet tops shall be formed into a 1" x 1-3/16" channel shape at front, with a 31/32" x 1/2" offset for door recess, and with flange at rear and sides for electro-welding cabinet top to cabinet back and ends.
4. Cabinet bottoms for storage cabinets shall have both sides and back formed up with a radius between flange and bottom to provide ease of cleaning, and shall be offset in front to provide a door recess rabbet for dust stop. Cabinet bottoms shall be formed to provide a flush 1" face rail with a return flange to give a 9/16" deep x 5" high toe space.
5. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be set in a channel formation in cabinet back and enclosed by end uprights.
6. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
7. Toe space rails shall interlock in back of bottom rail and with end panel to provide a welding plate, and shall extend to the floor with a flange turned back 1-1/2" and turned up 3/8" for support.
8. Glazed swinging doors shall be 3/4" thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with a 14 gauge hinge reinforcements welded in place. Doors shall be glazed with 1/8" float glass, held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be pierced for a recessed flush pull, as described under HARDWARE.

9. Solid panel swinging doors (two-piece) shall consist of an inner and outer pan formation, mechanically assembled after painting. All exterior surfaces shall be welded and ground smooth. Inner door pan shall be flanged for mechanical assembly. Door shall have a 14 gauge hinge reinforcement welded at hinge slot; as well as a full-height channel formation welded to inner pan. Doors shall be 3/4" thick and contain structural foam sound deadening material.

I. Steel Free Standing Table Construction:

1. In general, freestanding tables and/or apron and leg assemblies consist of welded leg assemblies connected to aprons by mechanical fasteners.
2. Table apron rails shall be formed of 16-gauge steel. The rails shall be 4" high, formed top and bottom into a 1.844" wide channel formation with 3/8" high return. Where drawers occur, the apron rails shall provide the required opening.
3. Table legs shall be 2" square welded tubing. Securely welded to bottom end shall be a 14-gauge die formed gusset with four flanges. A threaded clinch nut shall accommodate a 3/8" 16 x 2-1/2" long adjustment bolt.
4. Stretchers shall be constructed of 18-gauge steel and furnished where indicated on drawings. They shall be formed into a 2-7/64" x 1-1/2" channel formation, and secured to table legs by a die-formed clip of 16-gauge steel. Clips shall be welded at ends of channel.
5. Table tops shall be as indicated on drawing and by specifications, and all clips, screws and parts for fastening top to apron, shall be provided with apron section. Leg shoes for table legs shall be furnished with leg assembly.

2.04 PERFORMANCE REQUIREMENTS

A. Steel Casework Construction Performance:

1. Base cabinets shall be constructed to support at least a uniformly distributed load 200 lbs. per square foot of cabinet top area, including working surface without objectionable distortion or interference with door and drawer operation.
2. Base cabinet corner gussets with leveling bolts shall support 500 lbs. per corner, at 1-1/2" projection of the leveling bolt below the gusset.
3. Each adjustable and fixed shelf 4 ft. or shorter in length shall support an evenly distributed load of 40 lbs. per square ft. up to a maximum of 200 lbs., with nominal temporary deflection, but without permanent set.
4. Drawer construction and performance shall allow 13-5/8" clear when in an extended position and suspension system shall prevent friction contact with any other drawer or door during opening or closing. All drawers shall operate smoothly, a minimum of 10,000 cycles with an evenly distributed load of 150 lbs.

5. Swinging doors on floor mounted casework shall support 200 lbs. suspended at a point 12" from hinged side, with door swung through an arc of 160 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plane in a closed position.

B. Steel Paint System Finish:

1. After the component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.
2. After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a corrosion-resistant finish, #61 Light Neutral color, anywhere moisture can accumulate, using an "Electrodeposition" dip tank. Surfaces to be coated include the inside of cabinet doors and drawer heads, behind all cross rails, all inside surfaces underneath the cabinet interior bottom panel, inside front and rear posts, inside of sub-base members, and behind adjustable shelf front and back edges. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.
 - a. Finishes specified to be a color other than Light Neutral shall then receive an additional sprayed and heat cured color coat, of the color specified, on all surfaces exposed to view after installation except as follows: drawer bodies, case channels, removable backs in cupboards and removable shelves (other than those in open front units or glazed units with swinging or sliding doors).
 - b. These parts, along with the area under the toe space enclosure and the back of the cabinet when not exposed to view after installation, shall be #61 Light Neutral.
3. The completed finish system in standard colors shall meet the performance test requirements specified under PERFORMANCE TEST RESULTS. (Colors other than standard are available at extra cost, but they may, or may not, meet the performance test requirements. Also, standard colors applied to commercial items that are purchased and furnished as a part of this contract may or may not meet the performance test requirements).

C. Performance Test Ratings: Terms referred to in PERFORMANCE TEST RESULTS are as follows:

1. "Excellent" - indicates that test leaves no visible effect on the finish film other than an increase in gloss.

2. "Good" - indicates that the test leaves no effect other than slight discoloration, decrease in gloss or temporary slight softening of the finish film with no loss of adhesion and film protection.

D. Performance Test Results* (Chemical Spot Tests): Chemical spot tests shall be made by applying 10 drops (approximately $\frac{1}{2}$ cc) of each reagent to the surface to be tested. Each reagent shall be covered by a watch glass, convex side down, in the center of the puddle to hold the reagent in place, except volatile solvents shall have the reagent applied to a cotton ball, which in turn is covered by an inverted 2 ounce wide mouth bottle to retard evaporation. Reagents shall be allowed to remain on the surface for the time specified, and the tests shall be conducted in such manner that the testing surface is kept wet throughout the entire test period. After the time allowed for the test has elapsed, the surface shall be washed with soap and water, and dried before examination and evaluation. (This test approximates the actual condition of a reagent bottle setting in a puddle of the reagent on a surface).

Test Reagents*	Time In Minutes	Rating
1) Acetic Acid, 98%	60	Good
2) Sulfuric Acid, 25%	60	Excellent
3) Sulfuric Acid, 85%	60	Good
4) Hydrochloric Acid, 37%	60	Excellent
5) Nitric Acid, 25%	60	Excellent
6) Phosphoric Acid, 75%	60	Excellent
7) Perchloric Acid, 70%	60	Excellent
8) Methylene Chloride	60	Excellent
9) Sodium Hydroxide, 25%	60	Excellent
10) Sodium Hydroxide, 10%	60	Excellent
11) Ammonium Hydroxide, 28%	60	Excellent
12) Hydrogen Peroxide, 5%	60	Excellent
13) Ether	60	Excellent
14) Ethyl Alcohol	60	Excellent
15) Ethyl Acetate	60	Excellent
16) Xylene	60	Excellent
17) Acetone	60	Excellent
18) Formaldehyde, 37%	60	Excellent
19) Carbon Tetrachloride	60	Excellent
20) Methyl Ethyl Ketone	60	Excellent

*Where concentrations are indicated, percentages are by weight.

E. Performance Test Results (Bending Test):

1. An 18 gauge steel strip, finished as specified, when bent 180° over a $\frac{1}{2}$ " diameter mandrel, shall show no peeling or flaking off of the finish.

F. Performance Test Results (Adhesion):

1. Ninety or more squares of the test sample shall remain coated after the scratch adhesion test. Two sets of eleven parallel lines 1/16" apart shall be cut with a razor blade to intersect at right angle thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush. Examine under 100 foot-candles of illumination. Note: This test is based on ASTM D2197-68, "Standard Method of Test for Adhesion of Organic Coatings".

G. Performance Test Results (Hardness):

1. The test sample shall have a hardness of 4-H using the pencil hardness test. Pencils, regardless of their brand are valued in this way: 8-H is the hardest, and next in order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which is the softest).
2. The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one—that is, the hardest pencil that will not rupture the film—is then used to express or designate the hardness.

2.05 WORK SURFACES

A. Epoxy Resin Tops (KEMRESIN): Epoxy Resin tops shall consist of modified epoxy resin that has been especially compounded and cured to provide the optimum physical and chemical resistance properties required of a heavy-duty laboratory table top. Tops and curbs shall be a uniform mixture throughout their full thickness, and shall not depend upon a surface coating that is readily removed by chemical and/or physical abuse. Tops and curbs shall be non-glaring. Tops shall be 1" thick, exposed edges beveled top and bottom, and drip grooves provided on the underside at all exposed edges. 4" high curbs at the backs and ends of tops shall be 1" thick and bonded to the deck to form a square watertight joint. Sink cutouts shall be smooth and uniform without saw marks with the top edge beveled. The bottom edge of the sink opening shall be finished smooth with the edge broken to prevent sharpness. Corners of sink cutouts shall be radiused not less than 3/4".

B. Molded Epoxy Resin:

1. Physical Properties:
 - a. Flexural Strength (ASTM D 790) = 15,000 PSI.
 - b. Compressive Strength (ASTM D 695) = 30,000 PSI.
 - c. Hardness, Rockwell E (ASTM D 785) = 100.
 - d. Water Absorption (ASTM D 570) % by weight, 24 Hours = 0.04.

- e. % by weight, 7 Days = 0.05.
- f. % by weight, 2 Hour Boil = 0.04.
- g. Specific Gravity = 1.97.
- h. Tensile Strength = 8,500 PSI.

2. Performance Test Results (Heat Resistance): A high form porcelain crucible, size 0, 15 ml capacity, shall be heated over a Bunsen burner until the crucible bottom attains an incipient red heat. Immediately, the hot crucible shall be transferred to the top surface and allowed to cool to room temperature. Upon removal of the cooled crucible, there shall be no blisters, cracks or any breakdown of the top surface whatsoever.

3. Performance Test Results (Chemical Resistance): Tops shall resist chemical attacks from normally used laboratory reagents. Weight change of top samples submerged in the reagents* listed in the next paragraph for a period of seven (7) days shall be less than one-tenth of one percent, except that the weight change for those reagents marked with ** shall be less than one percent. (Tests shall be performed in accordance with ASTM D 543 at 77 deg F.). *Where concentrations are indicated, percentages are by weight.

Acetic Acid, Glacial	Iso-Octane
Acetic Acid, 5%	Kerosene
Acetone	Methyl Alcohol
Ammonium Hydroxide, 28%	Mineral Oil
Ammonium Hydroxide, 10%	Methyl Ethyl Ketone
Aniline Oil	Nitric Acid, 70%**
Benzene	Nitric Acid, 40%
Carbon Tetrachloride	Nitric Acid, 10%
Chromic Acid, 40%**	Oleic Acid
Citric Acid, 10%	Olive Oil
Cottonseed Oil	Phenol, 5%
Dichromate Cleaning Solution**	Soap Solution, 1%
Diethyl Ether	Sodium Carbonate, 20%
Dimethyl Formamide	Sodium Carbonate, 2%
Distilled Water	Sodium Chloride, 10%
Detergent Solution, 1/4%	Sodium Hydroxide, 50%
Ethyl Acetate	Sodium Hydroxide, 10%
Ethyl Alcohol, 95%	Sodium Hydroxide, 1%
Ethyl Alcohol, 50%	Sodium Hypochlorite, 5%
Ethylene Dichloride	Sulfuric Acid, 85%
Heptane	Sulfuric Acid, 30%
Hydrochloric Acid, 37%	Sulfuric Acid, 3%
Hydrochloric Acid, 10%	Toluene
Hydrogen Peroxide, 28%	Transformer Oil
Hydrogen Peroxide, 3%	Turpentine

NOTE: Dichromate cleaning solution is a formula from Lange's Handbook of Chemistry.

4. Performance Test Results (Chemical Spot Tests - 24 Hours): Chemical spot tests shall be made by applying 10 drops (approximately 1/2 cc) of each reagent to the surface to be tested. Each reagent (except those marked **) shall be covered with a 1-1/2" diameter watch glass, convex side down to confine the reagent. Spot tests of volatile solvents marked ** shall be tested as follows: A 1" or larger ball of cotton shall be saturated with the solvent and placed on the surfaces to be tested. The cotton ball shall then be covered by an inverted 2-ounce, wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire 24-hour test period and at a temperature of 77 degrees F. + 3 degrees F. At the end of the test period, the reagents shall be flushed from the surfaces with water and the surface scrubbed with a soft bristle brush under running water, rinsed, and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Spots where dyes have dried shall be cleaned with a cotton swab soaked in alcohol to remove the surface dye. The test panel shall then be evaluated immediately after drying.

Ratings:

A = No effect or slight change in gloss.
B = Slight change in color or marked loss of gloss.
C = Slight surface etching or severe staining.
D = Swelling, pitting, or severe etching.

Reagents*	Rating
Acetic Acid, 98%	A
Acetone**	A
Ammonium Hydroxide, 28%	A
Carbon Tetrachloride**	A
Chloroform**	A
Chromic Acid, 60%	C
Chromic Acid, 40%	C
Dichromate Cleaning Solution***	C
Dimethyl Formamide	A
Ethyl Acetate**	A
Ethyl Alcohol**	A
Formaldehyde, 37%	A
Formic Acid, 90%	A
Hydrochloric Acid, 37%	A
Hydrofluoric Acid, 48%	C
Hydrogen Peroxide, 28%	A
Methanol**	A
Methylethyl Ketone**	A
Nitric Acid, 70%	B
Phenol, 85%	A
Phosphoric Acid, 85%	A
Sodium Carbonate, 20%	A

Continued . . .

Reagents*	Rating
Sodium Hydroxide, 40%	A
Sodium Hydroxide, 10%	A
Sodium Hypochlorite, 5%	A
Sulfuric Acid, 96%	D
Sulfuric Acid, 85%	A
Toluene**	A
Wrights Blood Stain	A
Xylene**	A

* Where concentrations are indicated, percentages are by weight.

** Indicates these solvents tested with cotton and jar method.

*** Dichromate cleaning solution is a formula from Lange's Handbook of Chemistry.

2.06 SINKS CUPSINKS, AND DRAINS

- A. Molded Epoxy Resin Sinks (KEMRESIN): Sinks shall be molded of modified epoxy resin, carefully compounded with selected materials to provide maximum physical and chemical properties. Sinks shall be non-glaring with all inside corners coved and the bottom pitched to the drain outlet. Sinks shall possess a high resistance to mechanical and thermal shock.
- B. Molded Epoxy Resin Cup Drains (KEMRESIN): Molded Epoxy Resin cup drains shall be molded in one-piece of the same resin as specified for Molded Epoxy Resin sinks. They shall have an integral mounting flange and a 1-1/2" I.P.S. male straight thread outlet

2.07 SERVICE FITTINGS AND ACCESSORIES

- A. Materials:
 1. Laboratory Service Fittings: Service fittings shall be laboratory grade, and water faucets and valve bodies shall be cast red brass alloy or bronze forgings, with a minimum content of 85%. All fittings shall be chromium plated unless specified otherwise.
 2. Plastic Coated Finish (Sepia Bronze): When specified, laboratory service fittings shall have an acid resistant plastic coating applied over a fine sand-blasted surface. Surfaces shall be sprayed and baked three times with a minimum thickness of .0005 to .0010 mils. (See Performance Ratings).

3. Service Indexes: Fittings shall be identified with service indexes in the following color coding:

Hot Water:	Red
Cold Water:	Dark Green
Gas:	Dark Blue
Air:	Orange
Vacuum:	Yellow
Deionized Water:	White
Steam:	Black
Nitrogen:	Brown
Oxygen:	Light Green
Hydrogen:	Pink
Special Gases:	Light Blue

B. Construction:

1. Water Fittings: Water fittings shall be provided with a renewable unit containing all operating parts which are subject to wear. The renewable unit shall contain an integral volume control device and all faucets shall be capable of being readily converted from compression to self-closing, without disturbing the faucet body proper. Four (4) arm forged brass handles shall contain plastic screw-on type colored service index buttons.
2. Steam Fittings: Steam fittings shall have a black, heat resistant composition handle, and shall be the heavy pattern design with stainless steel removable seat and flat Teflon seat disc. They shall have Teflon impregnated packing, and shall be so constructed that they can be repacked under pressure.
3. Deionized Water Fittings: Deionized water fittings shall be chromium plated cast bronze with the interior tin lined, and shall be the self-closing type, or shall be made of aluminum and not be the self-closing type. Handles shall be furnished with tamper-proof and vandal resistant service indexes.
 - a. Air and vacuum deck mounting fitting shall be Kewaunee "W-0266-00."
4. Ground Key Valve Hose Cocks: Ground key type valves shall have forged body with 10 serration hose end. Handle plug shall be forged brass, long, tapered type with screw-on colored service index button. Valves shall be individually ground, lapped and sealed.
5. Needle Valve Hose Cocks: Needle type valves shall have a stainless steel replaceable floating cone, precision finished and self-centering. Cone locates against a stainless steel seat, easily removable and replaced with a socket wrench. Valve shall have "TEFLON" impregnated packing and designed so unit can be repacked while under pressure.

6. Gooseneck Type Outlets: Gooseneck outlets shall have a separate brazed coupling to provide a full thread attachment of anti-splash, serrated tip or filter pump fittings.
 - a. Hot and cold water mixing gooseneck faucet shall Kewaunee "W-0340-00."
 - b. Deck mounted deionized water faucet shall be Kewaunee "W-0407."
7. Remote Control Valves: All valves for remote control use shall be as previously specified, but shall be complete with aluminum extension rods, escutcheon plates, brass forged handles and screw-on type colored service index button.
8. Tank Nipples: Tank nipples shall be provided with locking nut and washer for all fixtures where fittings are anchored to equipment.
9. Sink Outlets: Unless otherwise specified, sink outlets for other than stainless steel sinks shall be sin, with integral cross bars, tapered for overflow and be complete with gasket and lock nut with 1-1/2" I.P.S. male straight thread outlet. Overflows shall not be furnished for sink outlets unless specifically called for.
10. Crumb Cup Strainers: Crumb cup strainers shall be stainless steel or chromium plated brass, as specified, and shall be furnished for stainless steel sinks, and be complete with gasket, lock nut and 4" long unthreaded tailpiece outlet in 1-1/2" size.
11. Vacuum Breakers: Vacuum breakers where required shall be "Nidel" or "Watts" unless otherwise specified or identified to be an integral part of the water fixture assembly.
12. Aerator Outlets: Aerator type outlets shall be furnished for all gooseneck water faucets not furnished with serrated hose connectors.
13. Waste Lines: Waste lines shall be furnished by other trades.
14. Traps: Traps shall be furnished by other trades.
15. Electrical Fittings: Electrical fittings shall contain 20 Amp., 125 Volt AC, 3-wire polarized grounded receptacles, unless otherwise specified. Pedestal and line-type boxes shall be of aluminum, metallic finish with stainless steel flush plates. Receptacle boxes shall be of plated steel. All electrical or conduit fittings called for or to be furnished under these specifications shall meet the requirements of the National Electrical Code.

C. Performance:

1. Maximum Line Pressures:

- a. Ground Key Cocks (Gas and Air): 40 PSI.
- b. Needle Point Cocks (Gas and Air): 65 PSI.
- c. Vacuum: 28.5" Mercury.
- d. Hot and Cold Water: 80 PSI.
- e. Steam: 30 PSI.

D. Sepia Bronze Finish Performance: Finish shall show no rupture, other than a slight discoloration or possible softening when subjected to the following fumes for approximately six (6) days: Plastic coated fittings shall be suspended in a container, 6 cu. ft. capacity 12" above open beakers, each containing 199 cc. of 70% Nitric Acid, 94% Sulphuric Acid, 37-38% Hydrochloric Acid, respectively. Finish shall also withstand direct contact of reagents dropped from a burette at a rate of 60 drops/min. for a period of 10 minutes. Chemicals are shown below:

Conc. Hydrochloric Acid	37-38%*
Conc. Nitric Acid	70%*
Conc. Sulphuric Acid	94%
Glacial Acetic Acid	99.5%*
Ethyl and Other Alcohols	
Toulene and Other Hydrocarbons	
Carbon - Tetrachloride	
Mineral Oil	

*Percentages are by weight.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine all building conditions related to installation of the Work, including all critical dimensions.

3.02 INSTALLATION

- A. Preparation: Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.
- B. Coordination: Coordinate the work of the Section with the schedule and other requirements of other work being prepared in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Casework:

1. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.
2. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
3. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.
4. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

D. Work Surfaces:

1. Where required due to field conditions, scribe to abutting surfaces.
2. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory.
3. Secure work surfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

3.03 ADJUST AND CLEAN

- A. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.
- B. Adjust doors, drawers and other moving or operating parts to function smoothly.
- C. Clean shop finished casework; touch up as required.
- D. Clean work surfaces and leave them free of all grease and streaks.
- E. Casework to be left broom clean and orderly.

3.04 PROTECTION

- A. Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.
- B. Advise Owner of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

END OF SECTION 12345

SECTION 12492 – VERTICAL LOUVER BLINDS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes aluminum vane vertical miniblinds and accessories.

1.02 RELATED WORK

- A. ROUGH CARPENTRY: Section 06100 for wood blocking and grounds for mounting vertical louver blinds and accessories.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

- B. Shop Drawings: Show location and extent of vertical louver blinds. Include elevations, sections, details, and dimensions not shown in product data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

- C. Samples for Verification: For the following products, prepared on samples from the same material to be used for the Work.

- 1. Louver Vane: Not less than 12 inches long.

- D. Window Treatment Schedule: Include vertical louver blinds in schedule using same room designations indicated on Drawings.

- E. Product Certificates: For each type of vertical louver blind product, signed by product manufacturer.

- F. Product Test Reports: For each type of vertical louver blind product.

- G. Maintenance Data: For vertical louver blinds to include in maintenance manuals. Include the following:

- 1. Methods for maintaining vertical louver blinds and finishes.

- 2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.

- H. Operating hardware.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain vertical louver blinds through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver blinds in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install vertical louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where vertical louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicated measurements on shop drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Vertical Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hunter Douglas Window Fashions.
 - 2. Levolor Contract; a Newell Company; Louver Drape.
 - 3. Springs Window Fashions Division, Inc.; Graber.

2.02 VERTICAL LOUVER BLINDS, ALUMINUM VANES

- A. Rail System: Headrail.
 - 1. Rails: Extruded aluminum, anodized; long edges returned or rolled; channel-shaped, enclosing operating mechanisms.
 - 2. Wheeled Carriers: Engineered plastic with self-lubricating wheels.
 - 3. Color: Match Levelor's "Cotton" #111.
- B. Louver Vanes: Aluminum, alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and not less than 3/8 inch overlap when vanes are rotated fully closed.
 - 1. Nominal Slat Width: 3-1/2 inches wide.
 - 2. Slat Finish: Match Levelor's "Cotton" #111.
- C. Vane Directional Control: Manual with plastic bead chain.
- D. Traversing Control: Manual with cord.
- E. Draw and Stack Position: Manufacturer's standard.
- F. Cord Tensioner Mounting: Manufacturer's standard.
- G. Valance: One vane insert.
 - 1. Finish Color Characteristics: Match color of louver slats.
- H. Louver Bottom: Connecting or spacing chains.
- I. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.
- J. Stack Release: Permitting stacked vanes to be moved away from stacking position for total access to glazed opening.
- K. Colors, Textures, Patterns, and Gloss: As selected by Architect from manufacturer's full range.

2.03 VERTICAL LOUVER BLINDS FABRICATION

- A. Product Description: Vertical louver blind consisting of equally spaced, synchronized louver vanes and rail system with self-aligning carrier mechanisms, carriers, traverse and vane directional mechanisms and controls, and installation hardware.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Blind Units Installed Between (Inside) Jambs: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb to jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head to sill dimension of opening in which each blind is installed.
 - 2. Blind Units Installed Outside Jambs: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.
- E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, unless anodized or plated finish is indicated. Apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Component Color: Provide cords and exposed-to-view metal and plastic matching or coordinating with vane color, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 VERTICAL LOUVER BLIND INSTALLATION

- A. Install blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior louver edges in any position are not closer than 2 inches to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.
- B. Flush Mounted: Install blinds with louver edges flush with finish face of opening when vanes are tilted open.
- C. Jamb Mounted: Install headrail flush with face of opening jamb and head.
- D. Head Mounted: Install headrail on face of opening head.
- E. Recessed: Install headrail concealed within blind pocket.
- F. Connections: Connect motorized operators to building electrical system.

3.03 ADJUSTING

- A. Adjust vertical louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

- A. Clean blind surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that vertical louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12492

DIVISION 15

MECHANICAL

SECTION 15005 – GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the mechanical work as herein called for and shown on the drawings.

1. 02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of Division 15 sections.
- C. Review all other contract documents to be aware of conditions affecting work herein.
- D. Division 16.

1. 03 CODES AND STANDARDS

All work under Division 15 shall be constructed in accordance with the latest adopted editions of all applicable codes including, but not limited to, the following. These codes, society and association recommendations constitute minimum requirements and no reductions from design requirements will be permitted.

- A. Comply with regulations and codes of utility suppliers.
- B. Where no specific method or form of construction is called for in the contract documents, the Contractor shall comply with code requirements when carrying out such work.
- C. Where code conflict exists, generally the most restrictive requirement applies. Comply with current code edition, unless noted.
- D. Additional codes or standards applying to a specific part of the work may be included in that section.
- E. The codes and standards covering mechanical work include, but are not limited to:
 1. Underwriter's Laboratories (UL).
 2. American National Standards Institution (ANSI).
 3. American National Standard for Laboratory Ventilation (ANSI/AIHA 29.5 – 1992).
 4. American Society of Testing Materials (ASTM).
 5. National Fire Protection Association (NFPA).
 6. National Electrical Manufacturers Association (NEMA)

7. Air Conditioning and Refrigeration Institution (ARI).
8. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
9. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).
10. Air Movement and Control Association (AMCA).
11. Standards of the Hydronic Institute (IBR).
12. Florida Building Code.
13. National Electric Code (NFPA 70).
14. Life Safety Code (NFPA 101).
15. Installation of Air Conditioning and Ventilation Systems (NFPA 101).
16. Florida Energy Efficiency Code.
17. Americans with Disabilities Act (ADA).

1.04 DEFINITIONS

- A. Provide: Furnish and install, complete and ready for intended use.
- B. Furnish: Supply and deliver to project site, ready for subsequent requirements.
- C. Install: Operation at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.05 PERMITS AND FEES

- A. Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.06 VERIFICATION OF OWNER'S DATA

- A. Prior to commencing any work, the Contractor shall satisfy himself as to the accuracy of all data as indicated in these plans and specifications and/or as provided by the Owner/Owner's Representative. Should the Contractor discover any inaccuracies, errors, or omissions in the data, he shall immediately notify the Engineer/Architect in order that proper adjustments can be anticipated and ordered. Commencement by the Contractor of any work shall be held as an acceptance of the data by him after which time the Contractor has no claim against the Owner resulting for alleged errors, omissions, or inaccuracies of the said data.

1.07 DELIVERY AND STORAGE MATERIALS

- A. Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

B. Extent of work is indicated by the drawings, schedules, and the requirements of the specification. Singular references shall not be construed as requiring only one device if multiple devices are shown on the drawings or are required for proper system operation.

1.08 FIELD MEASUREMENTS AND COORDINATION

A. The intent of the drawings and specifications is to obtain a complete and satisfactory installation. Separate divisional drawings and specifications shall not relieve the Contractor or subcontractors from full compliance of work of his trade indicated on any of the drawings or in any section of the specifications.

B. Verify all field dimensions and locations of equipment to insure close, neat fit with other trades' work. Make use of all contract documents and approved shop drawings to verify exact dimension and locations.

C. Coordinate work in this division with all other trades in proper sequence to insure that the total work is completed with contract time schedule and with minimum cutting and patching.

D. Locate all apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others.

E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval.

F. Carefully examine any existing conditions, piping, and premises. Compare drawings with existing conditions. Report any observed discrepancies. It shall be the Contractor's responsibility to properly coordinate the work and to identify the problems in a timely manner. Written instructions will be issued to resolve discrepancies.

G. Because of the small scale of the drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and room dimensions and take actual measurements on the job. Locate piping, ductwork, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and for coordination with all trades. Contractor shall not order materials or perform work without such verification. No extra compensation will be allowed because field measurements vary from dimensions and drawings. If field measurements show that equipment or piping cannot be fitted, the Engineer/Architect shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

1.09 GUARANTEE

A. The Contractor shall guarantee labor, materials and equipment for a period of one(1) year from Substantial Completion. Contractor shall make good any defect and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.

B. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his or her responsibilities during guarantee period.

1.10 APPROVAL SUBMITTALS

A. When approved, the submittal log and submittals shall be an addition to the specifications herewith, and shall be of equal force in that no deviation will be permitted except with the approval of the Engineer/Architect.

1. Shop drawings, product literature, and other approval submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following.
 - a. Submittals shall be properly organized in accordance with the approved submittal control log.
 - b. Submittals shall not include items from more than one specification section in the same submittal package unless approved in the submittal control log.
 - c. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control number, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approval stamps.
 - d. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
 - e. Submittals that include a series of fixtures or devices (such as plumbing fixtures or valves) shall be organized by the fixture number or value type and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.
 - f. The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

- B. If the shop drawings show variation from the requirements of the contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variation in writing in his letter of transmittal and on the submittal cover sheet in order that, if acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the contract.
- C. Review of shop drawings, product literature, catalog data, or schedules shall not relieve the Contractor from responsibility for deviations from contract drawings or specifications, unless he has in writing called to the attention of the Engineer/Architect each such deviation in writing at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, product literature, catalog data, or schedules. Any feature or function specified, but not mentioned in the submittal, shall be assumed to be included per the specification.
- D. Submit shop drawings as called for in other sections after award of the contract and before any material is ordered or fabricated. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than $\frac{1}{4}$ " per foot), with dimensions clearly showing the installation. Direct copies of small-scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other sections and shall show space allotted for it. Include construction details and materials.

1.11 TEST REPORTS AND VERIFICATION SUBMITTALS

- A. Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, submit the reports, review the reports and take corrective action within the scheduled contract time.

1.12 O&M DATA SUBMITTALS

- A. Submit Operation and Maintenance data as called for in other sections. When a copy of approval submittals is included in the O&M Manual, only the final "Approved" or "Approved as Noted" copy shall be used. Contractor shall organize these data in the O&M Manuals tabbed by specification number. Prepare O&M Manuals as required by Division 1 and as described herein. Submit manuals at the Substantial Completion inspection.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All material shall be new as shown on the drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

2.02 EQUIPMENT AND MATERIALS

- A. Shall be new and the most suitable grade for the purpose intended. Equipment furnished under this division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar units or equipment.
- B. Each item of equipment shall bear a nameplate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.
- C. The label of the approving agency, such as UL, IBR, ASME, ARI, AMCA, by which a standard has been established for the particular item shall be full view.
- D. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.
- E. A service organization with personnel and spare parts shall be available within two hours of each type of equipment furnished.
- F. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.
- G. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's product, or the particular products of named manufacturers, meet the detailed specifications and that size and arrangement of equipment are suitable for installation. The burden of proof that the proposed substitution is equal to a specified product shall rest entirely on the contractor.
- H. Model Numbers: Catalog numbers and model numbers indicated in the drawings and specifications are used as a guide in the selection of the equipment and are only listed for the contractor's convenience. The contractor shall determine the actual model numbers for ordering materials in accordance with the written description of each item and with the intent of the drawings and specifications.

2.03 REQUESTS FOR SUBSTITUTION

- A. Where a particular system, product or material is specified by name, consider it as a standard basis for bidding, and base proposal on the particular system, product or material specified.
- B. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.
 1. Required product cannot be supplied in time for compliance with Contract time requirements.

2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered to Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

C. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include, but shall not be limited to, data as follows for both the specified and substituted products:

1. Principal of operation.
2. Materials of construction or finishes.
3. Thickness of gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance curves.

If the approved substitution contains differences or omissions not specifically called to the attention of the Engineer/Architect, the Owner reserves the right to require equal or similar features to be added to the substituted products (or have the substituted products replaced) at the Contractor's expense.

D. The burden of proof that the proposed substitution is equivalent to a specified product shall rest entirely on the contractor.

2.04 ELECTRICAL

A. Mechanical contractor shall coordinate with the electrical contractor the exact requirements of all mechanical equipment being provided. Where approval submittals are required, this coordination shall be accomplished prior to making the submittals. The electrical design shown on the drawings support the mechanical equipment basis of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, points(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this design will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

- B. Mechanical contractor shall provide all HVAC control wiring including the Energy Management Control system sensors, alarms, and input/output signals and all relays, interlocks, warning lights, and control devices, complying with the requirements of Division 16. The intent is for the mechanical contractor to be responsible for the entire HVAC control system, including point-to-point wiring.
- C. Electrical contractor shall provide disconnect switches, starters, and contractors for mechanical equipment unless specifically noted as being furnished as part of mechanical equipment.
- D. Electrical contractor shall provide all power wiring, raceway and devices, and make final electrical connections to all mechanical equipment, switches, starters, contractors, controllers, and similar equipment.
- E. All duct-mounted smoke detectors shall be furnished and wired by the electrical contractor and installed by the mechanical contractor.

PART 3 - EXECUTION

3. 01 WORKMANSHIP

- A. All materials and equipment shall be installed and completed in a first class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Engineer/Architect.

3. 02 COORDINATION

- A. The Contractor shall be responsible for full coordination of the mechanical systems with shop drawings of the building construction so the proper openings and sleeves or supports are provided for piping, ductwork, or other equipment passing through slabs or walls.
- B. Any additional steel supports required for the installation of any mechanical equipment, piping, or ductwork shall be furnished and installed under the section of the specifications requiring the additional supports.
- C. It shall be the Contractor's responsibility to see that all equipment such as valves, dampers, filters and such other apparatus or equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the drawings.
- D. All connections to fixtures and equipment shown on the drawings shall be considered diagrammatic unless otherwise indicated by detail. The actual connections shall be made to fully suit the requirements of each case and adequately provide for expansion and servicing.
- E. The Contractor shall protect equipment, material, and fixtures at all times. He shall replace all equipment, material, and fixtures which are damaged as a result of inadequate protection.

- F. Prior to starting and during process of work, examine work and materials installed by others as they apply to work in this division. Report conditions which will prevent satisfactory installation.
- G. Start of work will be construed as acceptance of suitability of work of others.

3.03 INTERRUPTION OF SERVICE

- A. Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Engineer/Architect and this work shall be done at the time best suited to the Owner. This will typically be on weekends and/or holidays and/or after normal working hours. Services shall be restored the same day unless prior arrangements are made. All overtime or premium costs associated with this work shall be included in the base bid.

3.04 PHASING

- A. Provide all required temporary valves, piping, ductwork, equipment, and devices as required. Maintain temporary service to areas as required. Remove all temporary material and equipment on completion of work unless Engineer/Architect concurs that such material and equipment would be beneficial to the Owner on a permanent basis.

3.05 CUTTING AND PATCHING

- A. Notify General Contractor to do all cutting and patching of all holes, chases, sleeved, other openings required for installation of equipment furnished and installed under this section. Utilize experienced trades for cutting and patching. Obtain permission from Engineer/Architect before cutting any structural items.

3.06 EQUIPMENT SETTING

- A. Bolt equipment directly to concrete pads or vibration isolators as required, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment.
- B. All roof mounted equipment must adhere to current hurricane wind loading codes regarding equipment tie-down/anchoring, and wind resistance.

3.07 PAINTING

- A. Touch-up of factory finishes on equipment located inside and outside shall be done under Division 15. Obtain matched color coatings from the manufacturer and apply as directed. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required.

3.08 CLEAN-UP

- A. Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, contractor is to carefully clean up and leave premises and all portions of building free from debris and in a clean and safe condition.

3.09 START-UP AND OPERATIONAL TEST

- A. Start each item of equipment in strict accordance with manufacturer's instructions; or where noted under equipment specification, start-up shall be done by a qualified representative of the manufacturer. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.10 CLIMATE CONTROL

- A. Operate heating and cooling system as required after initial startup to maintain temperature and humidity conditions to avoid freeze damage and warping or sagging of ceilings and carpet.

3.11 RECORD DRAWINGS

- A. During the progress of the work the Contractor shall record on their field set of drawings the exact location, as installed, of all piping, ductwork, equipment, and other systems which are not installed exactly as shown on the contract drawings.
- B. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 section.

3.12 ACCEPTANCE

- A. Punchlist: Submit written confirmation that all punch list items have been checked and the required work completed.
- B. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with project, for one day to instruct permanent operating personnel in operation of equipment and control systems. This is in addition to any specific equipment operation and maintenance training.
- C. Operation and Maintenance Manuals: Furnish four complete manuals bounds in ring binders with Table of Contents, organized and tabbed by specification section. Manuals shall contain:
 1. Detailed operating instructions and instructions for making minor adjustments.
 2. Complete wiring and control diagrams.
 3. Routing maintenance operations.
 4. Manufacturer's catalog data, service instructions, and parts lists for each piece of operating equipment.
 5. Copies of approved submittals.
 6. Copies of manufacturer's warranties.
 7. Copies of test reports and verification submittals.
- D. Record Drawings: Submit record drawings.
- E. Test and Balance Report: Submit four certified copies. The Report shall be submitted for review prior to the Substantial Completion Inspection, unless otherwise required by Division 1.

- F. Acceptance will be made on the basis of tests and inspections of job. A representative of firm that performed test and balance work shall be in attendance to assist. Contractor shall furnish necessary mechanics to operate system, make any necessary adjustments and assist with final inspection.
- G. Control Diagrams: Frame under glass and mount on equipment room wall.

END OF SECTION 15055

SECTION 15105 – PIPES AND PIPE FITTINGS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to pipes and pipe fittings specified herein.
- C. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division 15 sections.

1. 02 CODES AND STANDARDS

- A. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
- B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job site brazing of piping work.
- C. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

1. 03 TEST REPORT AND VERIFICATION SUBMITTAL

- A. Submit welding certification for all welding installers.
- B. Submit brazing certification for all brazing installers.

PART 2 - PRODUCTS

2. 01 PIPING MATERIALS

- A. Provide pipe and tube of type, joint type, grade, size and weight (wall thickness of Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

2. 02 PIPE/TUBE FITTINGS

- A. Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching type, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.03 PIPING MATERIALS/PRODUCTS

- A. Soldering Materials:
 - 1. Tin-Antimony (95-5) Solder: ASTM B-32, Grade 95TA.
 - 2. Silver-Phosphorous Solder: ASTM B-32, Grade 96TS.
 - 3. Pipe Thread Tape: Teflon tape.
 - 4. Protective Coating: Koppers Bitumastic No. 505 or equal.
 - 5. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast iron flanges; raised-face for steel flanges, unless otherwise noted.
 - 6. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials. Materials shall be determined by installer to comply with installation requirements.
 - 7. Brazing Materials: Silver content of not less than 15%. Materials shall be determined by installer to comply with installation requirements.

2.04 COPPER TUBE AND FITTINGS

- A. Copper Tube:
 - 1. Copper Tube: ASTM B88, Type K or L as indicated for each service; hard-drawn temper unless specifically noted as annealed.
 - a. ACR Copper Tube: ASTM B280.
 - b. DWV Copper Tube: ASTM B306.
- B. Fittings:
 - 1. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
 - 2. Cast-Copper Solder Joint Drainage Fittings: ANSI B16.29.

2.05 STEEL PIPES AND PIPE FITTINGS

- A. Pipes:
 - 1. Black Steel Pipe: ASTM A-53 or A-120.
 - 2. Galvanized Steel Pipe: ASTM A-53 or A-120.
- B. Pipe Fittings:
 - 1. Threaded Cast Iron: ANSI B16.4.
 - 2. Threaded Malleable Iron: ANSI B16.3; plain or galvanized as indicated.
 - 3. Malleable Iron Threaded Unions: ANSI B16.39; selected by installer for proper piping fabrication and service requirements including style, end connections, and metal-to-metal seats (iron, bronze or brass); plain or galvanized as indicated.
 - 4. Threaded Pipe Plugs: ANSI B16.14.
 - 5. Flanged Cast Iron: ANSI B16.1, including bolting.
 - 6. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing.

7. Wrought-Steel Butt welding Fittings: ANSI B16.9, except ANSI B16.28 for short radius elbows and returns, rated to match connected pipe.
8. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than schedule 80 pipe where length remaining unthreaded is less than 1 ½ inches, and where pipe size is less than 1 ½ inches, and do not thread nipples full length (no close nipples).

2.06 PLASTIC PIPES AND FITTINGS

- A. Pipes:
 1. PVC DWV Pipe: ASTM D-2665, Schedule 40.
- B. Fittings:
 1. PVC Solvent Cement: ASTM D-2564.
 2. PVC DWV Socket: ASTM D-2665.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings, not bushings. Align piping accurately at connections, within 1/16" misalignment tolerance.
- B. Comply with ANSI B31 Code for Pressure Piping.
- C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of building; limit clears to ½" where furring is shown for enclosure of concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation.
- D. Concealed Piping: Unless specifically noted as "Exposed" on the drawings, conceal piping from view in finished and occupied spaces, by locating in column enclosures, chases, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- E. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical, communications, or data equipment spaces and enclosures, unless shown. Install drip pan under piping that must run through electrical spaces.
 1. Cut pipe from measurements taken at the site, not from drawings. Keep pipes free of contract with building construction and installed work.

3.02 PIPING SYSTEM JOINTS

- A. Provide joints of the type indicated in each piping system.
- B. Solder copper tube and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply non-acid type solder flux to joint areas of both tubes and fittings. Insert tube depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- C. Thread pipe in accordance with ANSI B2.0; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed. Paint exposed threads to retard rusting.
- D. Flanged Joints: Match flanges within piping system, and at connection with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets. Bolts shall project 1/8" to 3/8" beyond nut face when tight.
- E. Weld pipe joints in accordance with recognized industry practice and as follows. Be guided by ANSI B.31.
 - 1. Weld pipe joints only when ambient temperature is above 0° F.
 - 2. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
 - 3. Use pipe clamps or tack-weld joints; 4 welds for pipe sizes to 10". All welds shall be open-butt.
 - 4. Build up welds with root pass, followed by filler pass and then a cover pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
 - 5. Do not weld-out piping system imperfections by tack welding procedures; refabricate to comply with requirements.
 - 6. At Installer's option, install forged branch connection fittings wherever branch pipe is less than 3" and at least two pipe sizes smaller than main pipe indicated; or install regular "T" fitting, Weld-O-Let or equal.
 - 7. All field welding and cutting using oxygen-acetylene methods within the building shall be performed in accordance with NFPA-51B (1994).
- F. Plastic Pipe Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.
 - 1. Solvent-cemented joints shall be made in accordance with ASTM D-2235 and ASTM F-402.

3.03 PIPING INSTALLATION

- A. Install piping to allow for expansion and contraction.

- B. Isolate all copper tubing from steel and concrete by wrapping the pipe at the contact point, and for one inch on each side, with at least two layers of plastic electrical tape. Isolate all copper tubing installed in block walls with a continuous plastic sleeve.
- C. Underground Piping:
 - 1. Provide plastic tape markers over all underground piping. Provide copper wire over all underground plastic piping. Locate markers 18" above piping.
 - 2. Coat the following underground (uninsulated) pipes with a heavy coat of bitumastic or provide an 8 mil polyvinyl sleeve: black steel pipe, galvanized steel pipe, copper tubing.

END OF SECTION 15105

SECTION 15110 – VALVES

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to the work of this section.
- B. This section is a Division 15 Basic Materials and Methods section, and is part of each Division 15 section making reference to or requiring valves specified herein.
- C. Extent of valves required by this section is indicated on drawing and/or specified in other Division 15 sections.

1. 02 QUALITY ASSURANCE

- A. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding end valve bodies, comply with ANSI B16.10.
- B. Valve Types: Provide valves of same type by same manufacturer.
- C. Valves Installed in Boiler Rooms: Comply with ASME Boiler and Pressure Vessel Code.

1. 03 APPROVAL SUBMITTALS

- A. When required by other Division 15 sections, submit product data, catalog cuts, specification, and dimensioned drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve comparison chart with applicable valve clearly marked if valves other than basis-of-design are to be used. For each valve, identify systems where the valve is intended for use.
- B. Gate Valves: Type GA.
- C. Check Valves: Type CK.
- D. Ball Valves: Type BA.
- E. Butterfly Valves: Type BF.

1. 04 O&M DATA SUBMITTALS

- A. Submit a copy of approved submittals. Submit installation instructions, maintenance data and spare parts lists for each type of valve. Include this data in the O&M Manual.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with specifications and installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide valves from one of the producers listed for each valve type. Other valve manufacturers' list names are also acceptable. The model numbers are listed for contractor's convenience only. In the case of a model number discrepancy, the written description shall govern.

2.03 GATE VALVES

A. Packing: Select valves designed for repacking under pressure when fully opened, equipped with non-asbestos packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.

B. Comply with the following standards:

1. Cast Iron Valves: MSS SP-70. Cast Iron Gate Valves, Flanged and Threaded Ends.
2. Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.
3. Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.

C. Types of Gate (GA) Valves:

1. Threaded Ends 3" and Smaller (GA1): Class 125, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-100. Nibco T-113. Crane 428. Milwaukee 148.
2. Soldered Ends 3" and Smaller (GA2): Class 125, bronze body, screwed bonnet, non-rising stem, solid wedge. Stockham B-108 or B-109. Nibco S-113. Crane 1334. Milwaukee 149.
3. Flanged Ends 4" and Larger (GA3): Class 125, iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge. Stockham G-623. Nibco F617-0. Crane 465 ½. Milwaukee F2885.
4. Threaded Ends 2" and Smaller (GA4): Class 150, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-122. Nibco T-131. Crane 431. Milwaukee 1150.
5. Flanged Ends 2" and Smaller (GA5): Class 150, bronze body, screwed bonnet, rising stem, solid wedge. Stockham B-124. Nibco S-134. Milwaukee 1169.
6. Threaded Ends 2" and Smaller (GA6): 175 WWP, bronze body, screwed bonnet, rising stem, solid, OS&Y, solid wedge, UL listed. Stockham B-133. Nibco T-104-0.
7. Flanged Ends 2 ½" and Larger (GA7): 175 WWP, iron body, bolted bonnet, rising stem, OS&Y, solid wedge, UL listed. Stockham G-634. Nibco F-607-OTS.
8. Threaded Ends 2" and Smaller (GA8): Class 200, bronze body, union bonnet, rising stem, solid wedge, renewable seat. Stockham B-132. Nibco T-154-SS. Milwaukee 1174.
9. Flanged Ends 2 ½" and Larger (GA9): Class 250, iron body bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge. Stockham F-667. Crane 7 ½E. Milwaukee F-2894.

10. Threaded Ends 2" and Smaller (GA10): Class 300, bronze body, union bonnet, rising stem, solid wedge, renewable seat. Stockham B-145. Nibco T-174-SS. Crane 634E. Milwaukee 1184.
11. Flanged Ends 2 ½" and Larger (GA11): Class 300, cast steel body, bolted bonnet, rising stem, solid wedge, seal-welded seat rings. Provide trim to match use. Stockham 30-0F. Crane 33.
12. Flanged Ends 2 ½" and Larger (GA12): 300 WWP, iron body, bolted bonnet, bronze mounted, rising stem, OS&Y, solid wedge, UL listed. Stockham F-670. Nibco F-697-0.

2.04 CHECK VALVES

- A. Construction: Construct valves of castings free of any impregnating materials. Construct valves with a bronze regrinding disc with a seating angle of 40° to 45°, unless a composition disc is specified. Provide stop plug as renewable stop for disc hanger, unless otherwise specified. Disc and hanger shall be separate parts with disc free to rotate. Support hanger pins on both ends by removable side plugs.
- B. Comply with the following standards:
 1. Cast Iron Valves: MSS SP-71. Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 2. Bronze Valves: MSS SP-80. Bronze Gate, Globe, Angle and Check Valves.
 3. Steel Valves: ANSI B16.34. Steel Standard Class Valve Ratings.
- C. Types of Check (CK) Valves:
 1. Threaded Ends 2" and Smaller (CK1): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-319. Nibco T-413. Crane 1707. Milwaukee 509.
 2. Soldered Ends 2" and Smaller (CK2): Class 125, bronze body, screwed cap, horizontal swing, bronze disc. Stockham B-309. Nibco S-413-B. Crane 1707S. Milwaukee 1509.
 3. Flanged Ends 2 ½" and Larger (CK3): Class 125, iron body, bronze mounted, bolted cap, horizontal swing, cast-iron or composition disc. Stockham G-931 or G-932 as applicable. Nibco F918-B. Crane 373. Milwaukee F2974 as applicable.
 4. Threaded Ends 2" and Smaller (CK4): 200 WWP, bronze body, screwed cap, horizontal swing, regrinding type bronze disc, for fire sprinkler use. Nibco KT-403-W.
 5. Flanged Ends 2 ½" and Smaller (CK5): 175 WWP, iron body, bolted cap, bronze mounted, composition disc, UL listed, with ball drip if required. Stockham G-940. Nibco F-908-W.
 6. Threaded Ends 2" and Smaller (CK6): Class 200, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-345. Nibco T-453-B. Crane 36. Milwaukee 518/508.
 7. Flanged Ends 2 ½" and Larger (CK7): Class 250, iron body, bronze mounted, bolted cap, cast iron disc. Stockham F-947. Nibco F-968-B. Crane 39E. Milwaukee F2970.

8. Threaded Ends 2" and Smaller (CK8): Class 300, bronze body, screwed cap, Y-pattern swing, regrinding bronze disc. Stockham B-375. Nibco T-473-B. Crane 76E. Milwaukee 517/507.
9. Flanged Ends 2 ½" and Larger (CK9): Class 300, cast steel body, bolted cap, horizontal swing, sealed welded seat rings, chromium stainless disc. Stockham 30-SF. Crane 159.

2.05 BALL VALVES

- A. General: Select valve size equal to or greater than connecting pipe area, include seat ring designed to hold sealing material.
- B. Construction: Ball valves shall be rated for 150 psi saturated steam and 600 psi non-shock cold water. Pressure containing parts shall be constructed of ASTM B-584 alloy 844, or ASTM B-124 alloy 377. Valves shall be furnished with blowout proof bottom loaded stem constructed of ASTM B-371 alloy 694 or other approved low zinc material. Provide TFE packing, TFE thrust washer, chrome plated ball and reinforced Teflon seats. Valves 1" and smaller shall be full port design. Valves 1 ¼" and larger shall be conventional port design. Stem extensions shall be furnished for use in insulated piping where insulation exceeds ½" thickness.
- C. Comply with the following standards:
 1. MSS SP-72. Ball Valves with Flanged or Butt Welding Ends for General Service.
 2. MSS SP-110. Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- D. Types of Ball (BA) Valves:
 1. Threaded Ends 3" and Smaller (BA1): Bronze two-piece full port body with adjustable stem packing. Nibco T-585-70. Stockham S216-BR-R-T. Milwaukee BA 125. Apollo 77-100.
 2. Soldered Ends 3" and Smaller (BA2): Bronze three-piece full port body with adjustable stem packing. Nibco S-595-Y-66. Milwaukee BA350. Apollo 82-200.
 3. Threaded Ends 3" and Smaller (BA3): Bronze two-piece full port body, UL listed (UL842) for use with flammable liquids and LP gas. Nibco T-585-70-UL.
 4. Threaded Ends 2" and Smaller (BA4): 175 WWP, bronze two-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.
 5. Threaded Ends 2" and Smaller (BA5): 400 WWP, bronze two-piece body, for fire protection service. Nibco KT-580.
 6. Threaded Ends 2 ½" and Smaller (BA6): 300 WWP, bronze three-piece body, gear operator with handwheel, indicator flag, accepts tamper switch, for fire protection, UL listed. Nibco T-505-4 and G-505-4.
 7. Flanged Ends 2 ½" and Larger (BA7): Class 150, carbon steel full bore two-piece body with adjustable stem packing. Nibco F515-CS series. Apollo 88-240.

2.06 BUTTERFLY VALVES

- A. General: Comply with MSS SP-67, Butterfly Valves. Provide butterfly valves designed for tight shut-off. Provide gear operators on all butterfly valves 6" and larger. Provide lever operators for valves under 6 inches.
- B. Types of Butterfly (BF) Valves:
 - 1. Lug Type 3" and Larger (BF1): 200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-712. Nibco LD 2110-3. Nibco WD 2110-5. Crane 44-FXB-TL. Milwaukee ML123B-8416.
 - 2. Lug Type 3" and Larger (BF2): 150/200 CWP, cast iron body, cadmium plated ductile iron disc, Type 410 stainless steel stem, EPT seat. Stockham LG-722 and LG-721. Nibco LD 2110-5. Crane 44-FXB-G. Milwaukee ML 123B-8115.
 - 3. Lug Type 4" and Larger (BF3): 175 WWP, cast iron body, nickel-plated ductile or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-72U. Nibco LD 3510-8.
 - 4. Grooved Type 4" and Larger (BF4): 175 WWP, cast iron body, nickel plated ductile iron or aluminum bronze disc, Type 410 stainless steel stem, EPT seat, UL listed. Stockham LG-82U. Nibco GD 1765-2.

2.07 VALVE FEATURES

- A. General: Provide valves with features indicated and where not otherwise indicated, provide proper valve features as determined by Installer for installation requirements. Comply with ANSI B31.1.
- B. Valve features specified or required shall comply with the following:
 - 1. Flanged: Provide valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (bronze).
 - 2. Threaded: Provide valve ends complying with ANSI B2.1.
 - 3. Solder-Joint: Provide valve ends complying with ANSI B16.18.
 - 4. Trim: Fabricate pressure-containing components of valve, including stems (shafts) and seats from brass or bronze materials, of standard alloy recognized in valve manufacturing industry unless otherwise specified.
 - 5. Non-Metallic Disc: Provide non-metallic material selected for service indicated in accordance with manufacturer's published literature.
 - 6. Renewable Seat: Design seat of valve with removable disc, and assemble valve so disc can be replaced when worn.
 - 7. Extended Stem: Increase stem length by 2: minimum, to accommodate insulation applied over valve.
 - 8. Mechanical Actuator: Provide factory fabricated gears, gear enclosure, external chain attachment and chain designed to provide mechanical advantage in operating valve for all valves 4" and larger that are mounted more than 7' 0" above the floor, or are otherwise difficult to operate regardless of height.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install valves where required for proper operation of piping and equipment, including valves in branch lines to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward below horizontal plane.
- B. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.
- C. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator.
- D. Mechanical Actuators: Install mechanical actuators as recommended by valve manufacturer.

3.02 SELECTION OF VALVE ENDS (PIPE CONNECTION)

- A. Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
 - 1. Tube Size 2" and Smaller : Threaded valves. Soldered joint valves may also be used.
 - 2. Pipe Size 2" and Smaller: Threaded valves.
 - 3. Pipe Size 2 $\frac{1}{2}$ " and Larger: Flanged valves.

3.03 NON-METALLIC DISC

- A. Limit selection and installation of valves with non-metallic disc to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.

3.04 RENEWABLE SEATS

- A. Select and install valves with renewable seats, except where otherwise indicated.

3.05 INSTALLATION OF CHECK VALVES

- A. Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction flow.

END OF SECTION 15110

SECTION 15115 – ELECTRIC MOTORS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section apply to the work of this section.
- B. This section is a Division 15 Basic Materials Mechanical Materials and Methods section, and is part of each Division 15 section making reference to motors specified herein.
- C. Extent of motors required by this section is indicated on drawings and/or specified in other Division 15 sections.
- D. Comply with the requirements of Division 16.
- E. UL Compliance: Comply with applicable UL standards pertaining to motors.

1. 02 APPROVED SUBMITTALS

- A. Product Data: When required by other Division 15 sections, submit manufacturers' standard product data sheets for each type of motor provided. Submit with Division 15 section using the motors, not as a separate submittal. Mark data sheet with arrows indicating product being supplied and list by unique descriptive name all motors to which each data sheet applies. Clearly indicate type, service, factor, rpm, duty, cycle, voltage, phase, nominal full load efficiency, power factor and insulation class. Field verify and coordinate mounting and frame requirements for matching the drive.

1. 03 O&M DATA SUBMITTALS

- A. Submit a copy of approved submittals. Submit operation and maintenance data for each type of motor. Include these data in O&M Manual. Submit two copies of nameplate data sheet for each motor. One copy shall be included with the O&M Manual and a second copy shall be inserted in a waterproof pouch or bag and attached to the motor. Nameplate sheets shall be typed or neatly printed and shall include all data on the motor nameplate plus a unique motor description such as "AHU-3 Fan Motor," "Distribution Pump #1" or similar description.

PART 2 - PRODUCTS

2. 01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, General Electric, Baldor, US Electric or approved equal.

2. 02 GENERAL

- A. Motors shall conform to applicable portions of NEMA Standard MG-1, Motors and Generators.
- B. Motors shall be sized for the application such that when the driven equipment is operated at rated capacity, the motor current will not exceed the full load nameplate current. Service factor shall not be used in normal operation.

2.03 MOTOR DESIGN

A. Integral Horsepower Motors:

1. Motors shall be open drip proof or totally enclosed fan cooled as shown on the drawings or listed in the Division 15 section-requiring motors.
2. Motors shall be three phase, 60 hertz, nominal 1800 rpm, rated at 200 volts for 208-volt systems, 230 volts for 240-volt systems and 460 volts for 480-volt systems.
3. Motors shall be NEMA Design B and shall have 1.15 service factor or greater at 60 hertz.
4. Insulation Systems:
 - a. In fixed speed applications, motors shall have Class B insulation with 175°F rise over 105°F ambient.
 - b. For variable frequency drive (VFD) applications, motors shall have Class F insulation with 220°F rise over 105°F ambient. Motor manufacturer shall identify motors being used for VFD applications by marking the motor with a stainless steel nameplate "Inverter Duty." Motors shall be provided with one set of thermostatic sensors.
5. Motor efficiencies shall be based on IEEE-112, 2004, Test Method B, as specified in NEMA Standard MG1-12.53. NEMA motor efficiency and power factor shall be clearly shown on the motor nameplate. Inverter duty motors shall have a CIV rating based on NEMA.
6. Motors shall be premium efficiency type and shall meet or exceed the following nominal efficiencies at rated voltage.

Minimum Efficiencies				Minimum Efficiencies			
Open Drip-Proof				Totally Enclosed Fan-Cooled			
Rating HP	1200 RPM	1800 RPM	3600 RPM	Rating HP	1200 RPM	1800 RPM	3600 RPM
1	82.5%	85.5%	77.0%	1	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%	1.5	87.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%	2	88.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%	3	89.5%	89.5%	86.5%
5	89.5%	89.5%	86.5%	5	89.5%	89.5%	88.5%
7.5	90.2%	91.0%	88.5%	7.5	91.0%	91.7%	89.5%
10	91.7%	91.7%	89.5%	10	91.0%	91.7%	90.2%
15	91.7%	93.0%	90.2%	15	91.7%	92.4%	91.0%
20	92.4%	93.0%	91.0%	20	91.7%	93.0%	91.0%
25	93.0%	93.6%	91.7%	25	93.0%	93.6%	91.7%
30	93.6%	94.1%	91.7%	30	93.0%	93.6%	91.7%
40	94.1%	94.1%	92.4%	40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%	50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%	60	94.5%	95.0%	93.6%
75	94.5%	95.0%	93.6%	75	94.5%	95.4%	93.6%
100	95.0%	95.4%	93.6%	100	95.0%	95.4%	94.1%
125	95.0%	95.4%	94.1%	125	95.0%	95.4%	95.0%
150	95.4%	95.8%	94.1%	150	95.8%	95.8%	95.0%
200	95.4%	95.8%	95.0%	200	95.8%	96.2%	95.4%

7. Motors 25 hp and larger which are to be installed outdoors or in other high humidity areas shall be equipped with silicone rubber space heaters. Space heater shall be energized when the motor is de-energized.

B. Fractional Horsepower Motors One-Half HP and Above:

1. Motors shall be open drip proof or totally enclosed fan cooled as shown on the drawings or listed in the Division 15 section requiring motors.
2. Motors shall be three phase, 60 hertz, nominal 1800 rpm, rated at 200, 230 or 460 volts as shown on the drawings.
3. Motors shall be NEMA Design B with class B insulation, unless used with variable frequency drives.

C. Fractional Horsepower Motors Less Than One-Half HP:

1. Motors shall be single phase, 60 hertz, nominal 1800 rpm, rated at 120 volts with integral thermal protection.
2. Overload Protection: Properly sized overload protection shall be provided for each motor. This protection may be an integral part of the motor or may be part of the motor controller and shall interrupt each underground conductor.

PART 3 - EXECUTION

3.01 MOTOR SIZE AND LOCATIONS

- A. Size and location of motors shown on the drawings are based on a particular design and may change with a different manufacturer. Submittal of shop drawings or product literature indicating motor sizes or locations different from that designed indicates that Contractor has fully coordinated any required changes to the electrical system with other trades. Approval (if made) is this basis and no additional cost will be allowed for any changes.
- B. Contractor shall verify and make any necessary adjustments to electrical service branch circuit wiring, branch circuit protection, overload protection, disconnect and controller (starter), or VFD based on actual nameplate data of the motors supplied prior to installation. Where applicable, connect motor winding thermostat to VFD.

3.02 MOTOR VOLTAGES

- A. Contractor shall field verify system voltage prior to ordering or installing any motors. Submittal of shop drawings or product literature indicating motor voltages indicates that Contractor has fully coordinated the motor with the electrical system and that any discrepancies have been resolved. Approval (if made) is on this basis and no additional cost will be allowed for any changes.

3.03 MOTOR MOUNTING

- A. Adjust motor mounting as required to adjust the drive train for proper operation and to accommodate belt or sheave changes or other requirements of the test and balance work.

END OF SECTION 15115

SECTION 15120 – PIPING SPECIALTIES

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to or requiring piping specialties specified herein.

1. 02 APPROVED SUBMITTALS

- A. Product Data: Submit product data with installation instructions and UL listing for:
 1. Dielectric unions.
 2. Strainers

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide factory fabricated specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2. 02 ESCUTCHEONS

- A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

2.03 DIELECTRIC UNIONS

- A. Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action and stop corrosion.

2.04 FIRE BARRIER PENETRATION SEALS

- A. Provide seals for any opening through fire rated walls, floors, or ceilings used as passage for mechanical components such as piping or ductwork in accordance with the requirements of Section 02720 – Firestopping.

2.05 FABRICATED PIPING SPECIALTIES

- A. Drip Pans: Provide drip pans fabricated from corrosion resistant sheet metal with watertight joints, and with edges turned up 2 ½". Reinforce top, either by structural angles or by rolling top over ¼" steel road. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
- B. Pipe Sleeves: Provide pipe sleeves of one of the following:
 1. Sheet Metal: Fabricate from galvanized sheet metal, round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6" 14 gage.
 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 3. Iron Pipe: Fabricate from cast iron or ductile iron pipe; remove burrs.
- C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, or one of the following:
 1. Caulking and Sealant: Provide foam or caulking and sealant compatible with piping materials used.

2.06 LOW PRESSURE Y-TYPE PIPELINE STRAINERS

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Provide Type 304 stainless steel screens.
 1. Water Strainers: Select for 200 psi working pressure (water, oil or gas). Provide 20 mesh screens through 2" size and 1/16 perforations for 2 ½" size and larger.
- B. Select from the following types:
 1. Threaded Ends 2" and Smaller: Cast iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
 2. Threaded Ends 2 ½" and Larger: Cast iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
 3. Flanged Ends 2 ½" and Larger: Cast iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.

PART 3 - EXECUTION

3.01 PIPE ESCUTCHEONS

- A. Install pipe escutcheons on each penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.

3.02 DIELECTRIC UNIONS

- A. Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.

3.03 FIRE BARRIER PENETRATION SEALS

- A. Provide pipe sleeve as required. Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. Refer to Specification Section 02720 - Firestopping.

3.04 DRIP PANS

- A. Locate drip pans under piping passing over within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

3.05 PIPE SLEEVES

- A. Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Engineer/Architect. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves $\frac{1}{4}$ " above level floor finish, and $\frac{3}{4}$ " above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
- B. Install sleeves in fire rated assemblies in accordance with the listing of the assembly and the fire barrier sealant.
- C. Install sheet metal sleeves at interior partitions and ceilings other than suspended ceilings. Fill annular space with caulking or fire barrier sealant as required.
- D. Install steel pipe sleeves at floor penetrations. Fill annular space with caulking or fire barrier sealant as required.

E. Install iron pipe sleeves at all foundation wall penetrations and at exterior penetrations; both above and below grade. Fill annular space with caulking or mechanical sleeve seals.

3.06 Y-TYPE STRAINERS

A. Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers $\frac{3}{4}$ " and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.

1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:

- a. Pumps.
- b. Temperature and control valves.
- c. Pressure reducing valves.
- d. Temperature or pressure regulating valves.

END OF SECTION 15120

SECTION 15150 – SUPPORTS, ANCHORS AND SEALS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General Supplementary Conditions and Division 1 Specification section, apply to work of this section.
- B. This section is a Division 15 Basic Materials and Methods section, and is part of each Division 15 section making reference to or requiring supports, anchors, and seals specified herein.
- C. Extent of supports, anchors and seals required by this section is indicated on drawings and/or specified in other Division 15 sections.
- D. Code Compliance: Comply with applicable codes pertaining to product materials and installation of supports, anchors and seals.
- E. MSS Standard Compliance:
 1. Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.
 2. Select and apply pipe hangers and support, complying with MSS SP-69.
 3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 4. Terminology used in this section is defined in MSS SP-90.
- F. UL Compliance: Provide products which are Underwriters Laboratories listed.

PART 2 - PRODUCTS

2. 01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide supports and hangers by Grinnel, Michigan Hanger Company, B-Line Systems, or approved equal.

2. 02 HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. Except as otherwise indicated, provide factory fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and support to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulating piping. Provide copper plated hangers and support for copper piping systems.
 1. Adjustable Steel Clevises: MSS Type 1.
 2. Steel Double Bolt Pipe Clamps: MSS Type 3.
 3. Adjustable Steel Band Hangers: MSS Type 7.

4. Steel Pipe Clamps: MSS Type 4.
5. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast iron floor flange.

B. Vertical Piping Clamps: Except as otherwise indicated, provide factory fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper plated clamps for copper piping systems.

1. Two-Bolt Riser Clamps: MSS Type 8.
2. Four-Bolt Riser Clamps: MSS Type 42.

2.03 HANGER-ROD ATTACHMENTS

- A. Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with ANDI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal piping hangers and building attachments, in accordance with MSS-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper plated hanger-rod attachments for copper piping systems.
- B. Steel Turnbuckles: MSS Type 13.
- C. Malleable Iron Sockets: MSS Type 16.

2.04 BUILDING ATTACHMENTS

- A. Except as otherwise indicated, provide factory fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

 1. Center Beam Clamps: MSS Type 21.
 2. C-Clamps: MSS Type 23.
 3. Malleable Beam Clamps: MSS Type 30.
 4. Side Beam Brackets: MSS Type 34.
 5. Concrete Inserts: MSS Type 18.

2.05 SADDLES AND SHIELDS

- A. Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- C. Protection Saddles: MSS Type 39; use with rollers, fill interior voids with segments of insulation adjoining insulation.

2.06 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- C. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ATM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy Duty Steel Trapezes: Fabricate from steel shapes or continuous channel struts selected for loads required; weld steel in accordance with AWS standards.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, and installers of other work requiring coordination with work of this section for purpose of reviewing material selection and procedures to be followed in performing the work in compliance with requirements specified.

3.02 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete or structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.
- B. In areas of work requiring attachments to existing concrete, use self-drilling rod inserts, Phillips Drill Co., "Red-Head" or equal.

3.03 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69 or as listed herein, whichever is most limiting. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

1. Horizontal steel pipe and copper tube 1 ½" diameter and smaller: support on 6-foot centers.
2. Horizontal steel pipe and copper tube over 1 ½" diameter: support on 10-foot centers.
3. Vertical steel pipe and copper: support at each floor.
4. Plastic pipe: support in accordance with manufacturer's recommendations.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

C. Paint all black steel hangers with black enamel. Galvanized steel and copper clad hanger do not require paint.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

E. Provision for Movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

F. Insulated Piping: Comply with the following installation requirements.

1. Shields: Where low compressive strength insulation or vapor barriers are indicated, install coated protective shields.
2. Clamps: Attach clamps, including spacers (if any) to piping projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

3.04 INSTALLATION OF ANCHORS:

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchors by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and elbows. Make provisions for presence of anchors as required to accommodate both expansion and contraction of piping.
- D. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

3.05 EQUIPMENT BASES

- A. Provide concrete housekeeping bases for all floor mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe fittings. Provide factory fabricated tank saddles for tanks mounted on steel stands. Prime and paint with black enamel.

END OF SECTION 15150

SECTION 15160 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to or requiring identification devices specified herein.
- C. Extent of mechanical identification work required by this section is indicated on drawings and/or specified in other Division 15 sections.
- D. Refer to Division 16 section for identification requirements of electrical work; not work of this section. Refer to other Division 15 sections for identification requirements for controls.
- E. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 15 sections. Where more than one type is specified for application, selection is Installer's option, but provide single selection for each category.

2. 02 PAINTED IDENTIFICATION MATERIALS

- A. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendation of ANSI A13.1 for piping and similar applications, but not less than 1 ¼" high letters for ductwork and not less than ¾" high letters for access door signs and similar operational instructions.
- B. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray can form and grade.
- C. Identification Paint: Standard Identification enamel.

2. 03 PLASTIC PIPE MARKERS

- A. Pressure Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers.
 - 1. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Engineer/Architect in cases of variance with name as shown or specified.

2. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.04 VALVE TAGS

- A. Brass Valve Tags: Provide 19 gage polished brass valve tags with stamp-engraved piping system abbreviation in $\frac{1}{4}$ " high letters and sequenced valve numbers $\frac{1}{2}$ " high, and with $\frac{5}{32}$ " hole for fastener. Provide 1 $\frac{1}{2}$ " diameter tags, except as otherwise indicated.
- B. Plastic Laminate Valve Tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in $\frac{1}{4}$ " high letters and sequenced valve numbers $\frac{1}{2}$ " high, and with $\frac{5}{32}$ " hole for fastener. Provide 1 $\frac{1}{2}$ " square black tags with white lettering, except as otherwise indicated.

2.05 ENGRAVED PLASTIC-LAMINATE SIGN

- A. General: Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and colors indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- B. Thickness: 1/16" for units up to 20-sq. in. or 8" length; 1/8" for larger units.
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.06 STAMPED NAMEPLATES

- A. Provide equipment manufacturer's standard stamped nameplates for motors, AHUs, pumps, etc.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 DUCTWORK IDENTIFICATION

- A. General: Identify air supply, return, exhaust, intake and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black or white.
- B. Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures, and at 50' spacings along exposed runs.
- C. Access Doors: Provide stenciled signs on each access door in ductwork and housings, indicating the purpose of access (to what equipment) and other maintenance and operating instructions and appropriate and procedural information.

3.03 PIPING SYSTEM IDENTIFICATION

- A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow.
 - 1. Plastic pipe markers.
 - 2. Stenciled markers, black or white for best contrast.
- B. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces and exterior non-concealed locations.
 - 1. Near each valve and control device.
 - 2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow patterns.
 - 3. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
 - 4. At access doors, manholes and similar access points which permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 - 7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.04 VALVE IDENTIFICATION

- A. Provide coded valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory fabricated equipment units, plumbing fixture faucets, convenience and lawn watering hose bibs, and shut-off valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. Coordinate code with operating instructions.

3.05 VALVE CHARTS

- A. Provide framed, glass covered valve charts for each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served.

3.06 MECHANICAL EQUIPMENT IDENTIFICATION

- A. Install engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device. Label shall indicate type of system and area served. Provide signs for the following general categories of equipment and operational devices:
 - 1. Main control and operating valves, including safety devices.
 - 2. Meters, gauges, thermometers and similar units.
 - 3. Fuel-burning units including boilers.

4. Pumps, compressors, chillers, condensers, and similar equipment.
5. Heat exchangers, coils and similar equipment.
6. Fans, blowers, primary balancing dampers and VAV boxes.
7. HVAC air handlers and fan coil units.
8. Tanks and pressure vessels.
9. Air conditioning indoor and outdoor units.

3.07 STAMPED NAMEPLATES

- A. Equipment manufacturers to provide standard stamped nameplates on all major equipment items such as motors, pumps, AHUs, etc. Where motors are hidden from view in equipment casing, or otherwise not easily accessible, etc.), the equipment supplier shall furnish a duplicate motor data nameplate to be affixed to the equipment casing in an easily visible location, unless data is already included on the equipment nameplate.

3.08 ADJUSTING AND CLEANING

- A. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
- B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION 15160

SECTION 15170 - ACCESS DOORS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specifications, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to or requiring access panels specified herein.

1.02 APPROVED SUBMITTALS

- A. Product Data: When required by other Division 15 sections, submit product data for access doors. Submit with Division 15 section using access doors, not as a separate submittal. Include rating data.

1.03 O&M DATA SUBMITTALS

- A. Submit a copy of approved submittal. Include this data in O&M Manuals.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide access doors by Milcor, Jay R. Smith, Zurn, BOICO, Elmdor, or approved equal.
- B. General: Where floors, walls and ceilings must be penetrated for access to mechanical work, provide types of access doors indicated. Furnish sizes indicated or where not otherwise indicated, furnish adequate size for intended and necessary access. Furnish manufacturer's complete units, of type recommended for application in indicated substrate construction, in each case, complete with anchorages and hardware.
- C. Access Door Construction: Except as otherwise indicated, fabricate wall/ceiling door units of welded steel construction with welds ground smooth; 16-gauge frames and 14-gauge flush panel doors; 175° swing with concealed spring hinges; flush screwdriver operated cam locks; factory applied rust inhibitive prime coat finish.
- D. Locks: Where indicated, provide flat pass key type individually keyed unless otherwise indicated, 2 keys.
- E. Fire Rated Access Doors: Where required furnish with 20-gauge insulated sandwich panel, automatic closing mechanism, cylinder type lock (self-latching with inside release mechanism), and continuous concealed steel hinge pin. Access doors shall carry the UL 1 1/2-hour "B" label.

PART 3 - EXECUTION

- A. Access door shall be installed to operate and service all mechanical equipment including valves, dampers, duct access panels, and other items requiring maintenance that are concealed above or behind finished construction. Access doors shall be installed in walls, chase and floors as necessary, but are not required in accessible suspended ceiling systems. Access doors shall have factory applied protective coating and baked enamel primer suitable for field painting.
- B. Access doors shall be installed by the Division installing the substrate construction. However, responsibility for furnishing and determining location of access doors is part of this Division's work. The style of access door shall be suitable for construction into which installed.
- C. Access doors shall be sized and located as required to provide proper maintenance and service access in accordance with the manufacturer's recommendations and code authority requirements for all devices and equipment.

END OF SECTION 15170

SECTION 15180 - TESTING, CLEANING AND STERILIZATION OF PIPING SYSTEMS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to or requiring the testing and other procedures specified herein.
- C. Notify the Engineer/Architect when system tests are ready to be witnessed at least 24 hours prior to the test.
- D. All material, test equipment, and devices required for cleaning, testing, sterilizing or purging shall be provided by the Contractor.

PART 2 - PRESSURE TESTS

2. 01 GENERAL

- A. Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with indicated medium and pressurize for indicated pressure and time.
- B. Required test period is four hours.
- C. No piping, fixtures, or equipment shall be concealed or covered until they have been tested. The Contractor shall apply each test and ensure that it is satisfactory for the period specified before calling the Engineer/Architect to observe the test. Test shall be repeated upon request to the satisfaction of those making the inspection.
- D. Observe each test station for leakage at the end of the test period. Test fails if leakage is observed or if pressure drop exceeds 5% of the test pressure.
- E. Check of systems during application of test pressures should include visual check for water leakage and soap bubble or similar check for air and nitrogen leakage.
- F. During heating and cooling cycles, linear expansion shall be checked at all elbows and expansion joints for proper clearance.
- G. Repair piping systems sections which fail required piping test. Disassemble and reinstall using new materials to extent required to overcome leakage. Do no use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

2. 02 PRESSURE TEST REQUIREMENTS

- A. Solid Waste, Vent: Test all piping within the building with a 10-foot head of water. Test piping in sections so that all joints are tested. Provide test tees as required.

- B. Domestic Water and Deionized Water: Perform hydrostatic test on all piping within the building at twice the normal static pressure at service point, but not less than 100 psig. Once tested, flush out piping and leave under pressure of the supply main or 40 psig for the balance of the construction period.
- C. Gas: Test with air at 150% of normal working pressure, but not less than 25 psig. The test and check for leaks shall be in accordance with NFPA-54.
- D. Compressed Air and Vacuum: Test with air at 150% of the normal operating pressure, but not less than 50 psig.

PART 3 - CLEANING AND STERILIZATION

3.01 GENERAL

- A. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water or blowdown with air before proceeding with required tests. Inspect each run of each system for completion of joints, supports, and accessory items.
- B. Flush and drain all water systems at least three times. Reverse flush systems from smallest piping to largest piping. Replace startup strainers with operating strainers.
- C. Blowdown all gas and compressed air systems with air (at a rate exceeding design) at least three times or until no residue shows at each outlet. Reverse blowdown systems from smallest piping to largest piping.

3.02 STERILIZATION OF DOMESTIC WATER SYSTEMS

- A. Prerequisites: All hot and cold water piping installed (complete) all fixtures connected, system flushed out, and system filled with water.
- B. The shut off valve at the water main shall be closed, all fixture outlets opened slightly, and a sterilizing solution shall be introduced at a manifold connection installed by the Contractor at the meter.
- C. The solution shall contain 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or calcium hypochlorite. The solution shall be allowed to stand in the system for at least eight hours after which the entire system shall be flushed.
- D. After final flushing, all aerators shall be removed, cleaned, and reinstalled. After final flush, the residual chlorine shall not exceed 0.2 parts per million.
- E. The Engineer/Architect shall be notified 24 hours prior to the procedure so that it can be witnessed.
- F. Provide sampling and certified report by an independent testing lab. Provide written Health Department approval of disinfection samples.

3.03 FUEL GAS

- A. Purge all fuel gas systems in accordance with NFPA 54.

END OF SECTION 15180

SECTION 15190 - EXCAVATION AND BACKFILL

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to or requiring excavation and backfill specified herein.
- C. Refer to other Division 15 sections and/or drawings for specific requirements of the particular piping system being installed. Where another Division 15 section or the drawings conflict with requirements of this section, the other Division 15 section or the drawings shall take precedence over the general requirements herein.
- D. OSHA: Contractor employee worker protection for all trenching and excavation operations shall comply with 29 CFR 1926.650 Subpart P and all current OSHA requirements.
- E. Trench Safety Act: Contractor shall comply with all requirements of Florida Statutes Chapter 553, including the requirement to provide a separate line items to identify the cost to comply on a per lineal foot of trench and per square foot of shoring.

PART 2 - PRODUCTS

2. 01 SAND

- A. Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand.

2. 02 GRAVEL

- A. Clean, well-graded hard stone or gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".

2. 03 EARTH

- A. Fill free of clay, muck, stones, wood, roots or rubbish.

2. 04 IDENTIFICATION TAPE

- A. Polyethylene 6 inches wide, 0.004 inches thick, continuously printed with "CAUTION" in large letters and type of pipe below.

2. 05 COPPER IDENTIFICATION WIRE

- A. Shall be 14-gauge.

PART 3 - EXECUTION

3.01 DITCHING AND EXCAVATION

- A. Shall be performed by hand wherever there is a possibility of encountering obstacles or any existing utility lines of any nature whatsoever. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavators within the limits of the building lines.

3.02 BEDDING

- A. Excavate to bottom grade of pipe to be installed, and shape bed of undisturbed earth to contour of pipe for a width of at least 50% of pipe diameter. If earth conditions necessitate excavation below grade of the pipe, such as due to the presence of clay, muck, or root, subcut and bring bed up to proper elevation with clean, new sand (as described in paragraph 2.01), deposited in 6" layers and tamped. Notify Engineer/Architect if subcut exceeds 12" or if bed is of unstable nature. In this case a 6" minimum layer of gravel will be required before sand bedding begins. Submit cut proposal if the earth conditions require subcut in excess of 12" or if gravel is required to achieve proper bedding.

3.03 PLACING

- A. Pipe shall be carefully handled into place. Avoid knocking loose soil from the bans of the trench into the pipe bed. Rig heavier sections with nylon slings in lieu of wire rope to avoid crushing or chipping. Pipe which is handled with insulation in place, coated pipe, and jacketed pipe shall have special handling slings as required to prevent damage to the material.

3.04 BACKFILLING

- A. Deposit clean new sand (as described in paragraph 2.01) to 6" above the pipe and tamp. Then deposit sand or earth carefully in 6" layers, maintaining adequate side support, especially on nonferrous piping materials. Compact fill in 6" layers, using mechanical means, up to the top elevation of the pipe, and in 12" layers to rough or finish grade as required. Fine grade and restore surface to original condition.

3.05 SPECIAL

- A. Excavations shall be installed and maintained in satisfactory condition during the progress of the work. Subsurface structures are to be constructed in adequately sized excavations. De-watering equipment shall be installed and properly maintained where required. Shoring shall be employed in the event of unstable soil condition, and in all cases where required by OSHA regulations and necessary to protect materials and personnel from injury.

3.06 IDENTIFICATION

- A. Install identification tape directly above all underground piping, one tape for each pipe where multiple pipes are installed. Depth of tape shall be at least 6" below finished grade and 24" above buried pipe. Install copper wire above non-metallic pipes.

END OF SECTION 15190

SECTION 15230 – DUCTWORK INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Divisions 1 Specifications sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.02 APPROVAL SUBMITTALS

- A. Product Data: Submit producer's data sheets and installation instructions on each insulation system including insulation, covering, adhesives, sealers, protection finishes, and other material recommended by the manufacturer for applications indicated. Submit for:
 - 1. Rigid duct insulation.
 - 2. Fiberglass blanket insulation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide insulation products by Knauf, Owens-Corning, Schuller, Certainteed.

2.02 FLAME/SMOKE RATINGS

- A. Provide composite mechanical insulation (insulation, coverings, sealers, mastic, and adhesive) with a flame spread rating of 25 or less, and a smoke developed rating of 50 or less as tested by ANSI/ASTM 84.

2.03 RIGID FIBERGLASS INSULATION BOARD

- A. ASTM C612, Type I, Class B-3 (temperature less than 350°F). Rigid duct insulation shall be 6 pcf density with UL rated aluminum foil vapor barrier.

2.04 FIBERGLASS BLANKET INSULATION

- A. ASTM C553, Type I, Class B-3 (temperature less than 350°F). Duct wrap shall be 1.1 pcf density with UL rated aluminum foil vapor barrier.

2.05 GENERAL PURPOSE MASTIC

- A. Benjamin Foster 35-00 Series, Insulcoustic VIAC Mastic, Childers CP-10, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2. 06 VAPOR BARRIER SEALANT

A. Benjamin Foster 30-35, Insulcoustic IC-501, 3M EC-1378, Childers CP-30, or approved equal. Provide "Low Odor" type. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2. 07 ADHESIVE

A. Benjamin Foster 85-20, Insulcoustic IC-205, 3M EC-35, Childers CP-82, Childers CP-89, or approved equal. The final selection of this product for the specific application indicated is the responsibility of the insulation supplier. The insulation system must meet the specified application.

2. 08 FIBER-GLAS MESH

A. 10x10 Mesh. Foster Mastafab or equal.

PART 3 - EXECUTION

3. 01 INSTALLATION OF RIGID INSULATION

A. Insulate all supply, return, exhaust and outdoor air ductwork exposed in mechanical rooms, mezzanines, fan lofts or in any finished spaces with 1 1/2" inch thick rigid fiberglass insulation with vapor barrier.

1. Clean and dry ductwork prior to insulating. Butt insulation firmly together to ensure complete and tight fit over surfaces to be covered. Install insulation materials with smooth and even surfaces. Maintain integrity of aluminum vapor barrier wherever possible. Extend insulation without interruption through walls, floors and similar ductwork penetrations except where otherwise indicated.
2. Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch wide swaths with 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 3 inches from all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaced as described herein.
3. Apply open mesh glass fabric embedded in vapor barrier mastic. Then apply a second coat of general-purpose mastic with aluminum grey color. This finish shall be complete over all seams and joints.

3. 02 INSTALLATION OF FIBERGLASS BLANKET INSULATION

A. Insulate all concealed supply, return, exhaust, and outdoor air ductwork and the backs of all ceiling supply outlets with 2" thick fiberglass blanket insulation with vapor barrier.

1. Insulate round elbows and fittings with wrap such that thickness is equal to adjoining duct covering. Clean and dry ductwork prior to insulating.

2. Adhere insulation to duct with 50 percent coverage using approved insulation adhesive applied in 6-inch spaces between swaths. Additionally secure insulation with perforated pins and Tuff-Bond or by self-sticking pins with a 3/8" self-tapping screw. Space on 12-inch centers and 2 inches for all edges. Ducts up through 24" wide only require one row of pins. Ducts over 24" wide shall have pins spaces as described herein.
3. Lap all joints 2 inches and seal joints with 4-inch wide strips of open mesh glass fabric embedded in two coats of general-purpose mastic.
4. Seal all punctures and breaks in aluminum vapor barrier with open mesh glass fabric and vapor barrier sealant.

END OF SECTION 15230

SECTION 15405 - INSULATION FOR PLUMBING EQUIPMENT AND PIPING

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods Sections apply to work of this section.

1. 02 APPROVED SUBMITTALS

- A. Product Data: Submit a producer's data sheets and installation instructions on each insulation system including insulation, coverings adhesives, sealers, protective finishes, and other material recommended by the manufacturer for applications indicated.
 - 1. Fiberglass pipe insulation.
 - 2. Flexible unicellular piping insulations.

1. 03 O&M DATA SUBMITTALS

- A. Submit a copy of all approved submittals. Include in O&M Manual.

PART 2 - PRODUCTS

2. 01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide insulation products by Armstrong, Schuller, Knauf, Owens Corning, Pittsburgh Corning, U.S. Rubber, or approved equal. All products shall be asbestos free.

2. 02 FLAME/SMOKE RATINGS

- A. Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesive) with a flame spread rating of 25 or less, and a smoke-developed rating of 50 or less, as tested by ANSI/ASTM E84.

2. 03 PIPE INSULATION MATERIAL

- A. Fiberglass Pipe Insulation: ASTM C547, Class 1 unless otherwise indicated. (Preformed sleeving with white all service jackets, suitable for temperatures up to 450°F).
- B. Flexible Unicellular Pipe Insulation: ASTM C534, Type I. (Tubular, suitable for use to 200°F).
- C. Staples, Bands, Wires, and Cement: As recommended by the insulation manufacturer for application indicated.
- D. Adhesives, Sealers, Protective Finishes: Products recommended by the insulation manufacturer for the application indicated.

- E. Jackets: ASTM C921, Type I (vapor barrier) for piping below ambient temperature, Type II (vapor permeable) for piping above ambient temperature. Type I may be used for all piping at Installer's option.

PART 3 - EXECUTION

3. 01 GENERAL

- A. Install thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.
- C. Maintain integrity of vapor barrier on insulation and protect it to prevent puncture and other damage. Label all insulation "ASBESTOS FREE."
- D. Do not apply insulation to surfaces while they are hot or wet.
- E. Do not install insulation until systems have been checked and found free of leaks. Surfaces shall be clean and dry before attempting to apply insulation. A professional insulator with adequate experience and ability shall install insulation.
- F. Do not install insulation on pipe systems until acceptance tests have been completed except for flexible unicellular insulation. Do not install insulation until the building is "dried-in."

3. 02 FIBERGLASS PIPE INSULATION

- A. Insulate the following piping systems (indoor locations):
 - 1. Domestic hot water 140°F: up to 3" pipe - 1 1/2" thick, over 3" pipe - 2" thick.
 - 2. Cold water pipe: 1/2" thick.
- B. Apply insulation to pipe with all side and end joints butted tightly. Seal longitudinal lap by pressurizing with plastic sealing tool. Apply 3-inch wide self-sealing butt strips to joints between insulation sections. Insulate all fittings, flanges, valves and strainers with premolded insulation. Apply coat of insulating cement to fittings and wrap with glass cloth overlapping each wrap 1" and adjacent pipe 2". Finish with heavy coat of general-purpose mastic. Premolded PVC covers may also be used, but no flexible inserts are allowed.
- C. Provide hanger or pipe support shields of 16 gauge (minimum) galvanized steel over the insulation which extends halfway up to the pipe insulation cover and at least 6" on each side of the hanger.
- D. Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainer blowoffs, flexible connections and expansion joints.

3.03 FLEXIBLE UNICELLULAR PIPE INSULATION

- A. Insulate the following piping systems:
 1. Horizontal above-grade waste piping receiving condensate from air conditioning units to points of connections receiving waste from 4 or more fixtures – 3/4" thick.
 2. Horizontal above grade waste piping receiving discharge from ice machines, coolers, freezers or similar units to points of connection receiving waste from 4 or more fixtures – 3/4" thick.
- B. Apply insulation in accordance with the manufacturer's recommendations and instructions. Mitre cut insulation to fit pipe fittings. Use approved cement to seal all joints and ends in the insulation.

END OF SECTION 15205

SECTION 15410 – PLUMBING PIPING

PART 1 - GENERAL

1. 01 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Domestic water piping system.

1. 02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. This is a Basic Mechanical Requirements Section. Provisions of this section apply to work of Division 15 sections.
- C. Review all other contract document to be aware of conditions affecting work herein.
- D. Section 15430 – Plumbing Specialties.
- E. Section 15440 – Plumbing Fixtures; Carriers.
- F. Section 15450 – Plumbing Equipment.

PART 2 - PRODUCTS

2. 01 SANITARY SEWER

- A. PVC Sewer Pipe, Schedule 40, DWV:
 - 1. ASTM D2751 pipe and fittings.
 - 2. Joints: Solvent weld, ASTM D2564.
 - 3. Solvent: ASTM D2564.

2. 02 SANITARY, WASTE DRAINAGE AND VENT SYSTEM (ABOVE GRADE)

- A. Cast Iron Pipe: C1SP1301, hubless, service weight. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Pipe Institute or receive prior approval of the Engineer.
 - 1. Fittings: Cast Iron.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight:
 - 1. Fittings: Cast Iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp and shield assemblies; CISPI 310.

2.03 CHEMICAL RESISTANT WASTE AND VENT SYSTEM (BURIED AND ABOVE GRADE)

- A. Polypropelene, Schedule 40 DWV.
 - 1. ASTM D4101.
 - 2. Fittings: socket joint "Enfield" or approved equal, ASTM D635.
 - 3. Joints: "Enfield" joint, ASTM 635.

2.04 WATER PIPING (BURIED)

- A. PVC Pipe: ASTM D2241, SDR 35.
 - 1. Fittings: PVC.
 - 2. Joints: ASTM F477, elastomeric gaskets.

2.05 WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn.
 - 1. Fittings: ASME B16.18, cast bronze or ASME B16.22 wrought copper and bronze.
 - 2. Joints: Solder ASTM B32, Grade 95TA.
- B. Galvanized Steel (3" and over).

2.06 UNIONS, FLANGES AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 - 1. Ferrous Pipe: 150 psig (1034 kPa) malleable iron threaded unions.
 - 2. Copper Tube and Pipe: 150 psig (1034 kPa) bronze unions with soldered joints.
- B. Pipe Size Over 2 Inches:
 - 1. Ferrous Pipe: 150 psig (1034 kPa) forged steel slip-on flanges, 1/16-inch thick preformed neoprene gaskets.
 - 2. Copper Tube and Pipe: 150 psig (1034 kPa) slip-on bronze flanges; 1/16-inch thick preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing Gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.07 GATE VALVES

- A. Acceptable Manufacturers:
 - 1. Crane Model 1700.
 - 2. Grinnell Model 3010.
 - 3. Hammond Model 1B640.
 - 4. Milwaukee Model 148 under 2 ½-inch.
 - 5. Milwaukee Model F2885(M) over 2-inch.
 - 6. Nibco Model T111.
 - 7. Stockham Model B-100.
- B. Up To and Including 2 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, single wedge or disc, solder or threaded ends. MSS SP-80.
- C. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends. MSS SP-70.

2.08 GLOBE VALVES

- A. Acceptable Manufacturers:
 - 1. Crane Model.
 - 2. Grinnell Model 3200.
 - 3. Hammond Valve Corp. Model 1B440.
 - 4. Milwaukee Model 502 under 2½-inch.
 - 5. Milwaukee Model F298(M) over 2-inch.
 - 6. Nibco Model T-211-B.
 - 7. Stockham Model B-16.
- B. Up To and Including 2 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, solder or threaded ends, with back seating capacity (repackable under pressure). MSS-SP-80.
- C. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc. MSS SP-85.

2.09 BALL VALVES

- A. Acceptable Manufacturers:
 - 1. Apollo Model 70-100, 70-200.
 - 2. Grinnell Model 3700 SJ, 3700.
 - 3. Hammond Model 8501, 8511.
 - 4. Milwaukee Model BA100, BA150.
 - 5. Nibco Model T-585-70, S-585-70.
 - 6. Stockham Figure S216-BR-T-S, S216-BR-T-T.

- B. Up To and Including 2 Inches: Bronze two piece body, stainless or chrome plated steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends, 600 psig WOG rated MSS, SP 110.

2.10 WATER PRESSURE REGULATING VALVES

- A. Acceptable Manufacturers: Watts Model 25AUB and 25 AUB-LP.
- B. Up To 2 Inches: Bronze body, stainless steel internal parts, fabric reinforce diaphragm, strainer, threaded and single union ends.
- C. Operating temperature maximum of 71° C (160° F). Adjustable normal pressure range from 172.4 – 517.1 kPa (25-75 psi), and low pressure range from 68.9 – 241.0 kPa (10-35 psi).

PART 3 - EXECUTION

3.01 PREPARATION

- A. Refer to Division 2 sections for excavation and backfilling requirements.
- B. Ream pipe and tube ends; remove burrs.
- C. Remove scale and dirt, on inside and outside, before assembly.

3.02 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Provide clearance for installation of insulation and access to valves and fittings.
- C. Install water and sewer lines below freeze line, with water piping buried a minimum of 24 inches.
- D. Where pipe support members are welded to structural building framing, scrape, brush, clean, and apply one coat of zinc rich primer to welding.
- E. Provide support for utility meters in accordance with requirements of utility companies.
- F. Install bell and spigot pipe with bell end upstream.
- G. Install valves with stems upright or horizontal, not inverted.

END OF SECTION 15410

SECTION 15430 – PLUMBING SPECIALTIES

PART 1 - GENERAL

1. 01 SECTION INCLUDES

- A. Floor Drains.
- B. Cleanouts.
- C. Recessed Valve Box.
- D. Water Hammer Arrestors. (SA)
- E. Trap Primers.

1. 02 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 01010 – Summary of Work: Owner furnished flammable gas and inert gas equipment.

1. 03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 02607 – Manholes and Covers.
- B. Section 15410 – Plumbing Piping.
- C. Section 15440 – Plumbing Fixtures.
- D. Section 15450 – Plumbing Equipment.

1. 04 REFERENCES

- A. ANSI/ASSE 1010 – (1996) Water Hammer Arrestors.
- B. ANSI/ASSE 1019 – (1995) Wall Hydrants.
- C. ASME A112.21.1 – (1991) Floor Drains.
- D. ASME A112.21.2 – (1983) Roof Drains.
- E. ASTM C478 – (1994) Precast Reinforced Concrete Manhole Sections.
- F. AWWA C510 – (1997) Double Check Valve Backflow – Prevention Assembly.
- G. AWWA C511 – (1997) Reduced Pressure Principle Backflow – Prevention Assembly.
- H. AWWA C700 – (1990; C700a) Cold Water Meters – Displacement Type, Bronze Main Case.
- I. AWWA C701 – (1988) Cold Water Meters – Turbine Type for Customer Service.
- J. AWWA C706 – (1991); Addenda 1992) Direct Reading Remote Registration Systems for Cold Water Meters.
- K. PDI WH-201 – (1992) Water Hammer Arrestors.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300 and 15010.
- B. Product Data:
 - 1. Floor Drains.
 - 2. Cleanouts.
 - 3. Wall and Ceiling Access Doors.
 - 4. Water Hammer Arrestors. (SA)
 - 5. Trap Primers.

1.06 PROJECT RECORD DOCUMENTS

- A. Record actual locations of equipment, cleanouts and backflow preventors.

1.07 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include frequency of testing required for proper operation of backflow preventor.
- B. Maintenance Data: Include installation instruction, spare parts lists, exploded assembly views.

1.08 EXTRA MATERIALS

- A. Provide two sets of loose keys and service kit for backflow preventors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Accepted Manufacturers:
 - 1. MIFAB.
 - 2. Josam.
 - 3. Smith.
 - 4. Wade.
 - 5. Zurn.
- B. Acceptable Wall and Ceiling Access Door Manufacturers:
 - 1. Josam.
 - 2. Smith.
 - 3. Wade.
 - 4. Woodford.
 - 5. Zurn.

2.02 FLOOR DRAIN

- A. Floor Drains:
 - 1. ANSI A112.21.1 load ratings.
 - 2. Lacquered cast iron body with double drainage flange.
 - 3. Weep holes.
 - 4. Reversible clamping collar.
 - 5. Strainers and Accessories:
 - a. FD-1: Round nickel-bronze strainer with backwater valve.
 - b. FD-2: Round bronze strainer and sediment bucket.
 - c. FD-3: Polished round adjustable stainless steel strainer.

2.03 CLEANOUTS

- A. Interior Finished Floor Areas (CO): Lacquered cast iron, two piece body with flange, round with scoriated cover in service areas and square with depressed cover to accept floor finish in finished floor areas.

2.04 WATER HAMMER ARRESTORS (SA)

- A. Description:
 - 1. ANSI/ASSE 1010.
 - 2. Sized in accordance with PDI WH-201.
 - 3. Precharged suitable for operation in temperature range 100° to 300° F and maximum 250 psig working pressure.
- B. Model Numbers:
 - 1. Josam – Absorbotron.
 - 2. Smith – Hydrotrol.
 - 3. Wade – Shokstop.
 - 4. Zurn – Shoktrol.

2.05 TRAP PRIMERS

- A. Description:
 - 1. Water saver trap primer.
 - 2. Trap primer valve.
 - 3. Distribution units.
- B. Model Numbers:
 - 1. Jay R. Smith – Prime EZE 2698.
 - 2. Precision Plumbing Products – P2-500.
 - 3. MIFAB – M1-500.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains.

3.02 INSTALLATION

- A. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36-inch sheet size. Fasten flashing to drain clamp device.
- B. Seal floor, shower and mop sink drains watertight to adjacent materials.
- C. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- D. Encase exterior cleanouts in concrete flush with grade.
- E. Pipe relief from back flow preventor to nearest drain.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories and sinks.

END OF SECTION 15430

SECTION 15440 – PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Water Closets.
- B. Lavatories.
- C. Showers.
- D. Sinks.
- E. Hose Bibbs.
- F. Emergency Shower Head.
- G. Emergency Eyewash.

1.02 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 01010 – Summary of Work: Owner furnished fixtures.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Section 06410 – Custom Casework: Preparation of counters for sinks.
- B. Section 06410 – Custom Casework: Lavatory tops.
- C. Section 07900 – Joint Sealers: Seal fixtures to walls and floors.
- D. Section 15140 – Supports and Anchors.
- E. Section 15410 – Plumbing Piping.
- F. Section 15430 – Plumbing Specialties.
- G. Section 15450 – Plumbing Equipment.

1.04 REFERENCES

- A. Latest edition or revision.
- B. ANSI/ASME A112.6.1 – Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- C. ANSI/ASME A112.18.1 – Finished and Rough Brass Plumbing Fixture Fittings.
- D. ANSI/ASME A112.19.1 – Enamelled Cast Iron Plumbing Fixtures.
- E. ANSI/ASME A112.19.2M – Vitreous China Plumbing Fixtures.
- F. ANSI/ASME A112.19.4 – Porcelain Enamelled Formed Steel Plumbing Fixtures.
- G. ANSI/ASME A11219.5 – Trim for Water Closet Bowls, Tanks and Urinals (Dimensional Standards).
- H. ANSI/ARI 1010 – Mechanically Refrigerated Drinking Water Coolers.
- I. ASSE 1037 – Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures.
- J. ASTM A167 – Stainless and Heat – Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

1.05 SUBMITTALS

- A. Submit under provisions of section 01300.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.
- B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Refer to Part 3 for specific fixture model numbers.
- B. Vitreous China and Enameled Cast Iron:
 1. American Standard.
 2. Crane.
 3. Eljer.
 4. Kohler.
- C. Stainless Steel:
 1. Advance.
 2. Elkay.
 3. Just.
 4. Kohler.
 5. Moen.
- D. Faucets and Hose Bibbs:
 1. American Standard.
 2. Bradley.
 3. Chicago.
 4. Crane.
 5. Eljer.
 6. Kohler.
 7. T & S Brass.
- E. Flush Valves:
 1. Sloan.
 2. Zurn.
 3. Delaney.

F. Carriers:

1. Josam.
2. Smith.
3. Wade.
4. Zurn.

G. Sealants:

1. Dow Corning.
2. General Electric.
3. Pecora.

H. Water Closet Seats:

1. Bemis.
2. Beneke.
3. Church.
4. Kohler.
5. Olsonite.

2.02 MATERIALS

A. Vitreous Fixtures:

1. ASME A112.19.2M.
2. Free of warpage, seam marks, pores and other imperfections.
3. Grind contact surfaces true.
4. Provide china caps for mounting hardware.

B. Stainless Steel Fixtures:

1. ASTM A167, type 302 or type 304 (18-8)-nickel bearing, self-rimming.
2. Welds ground smooth and surfaces polished to a #4 bright finish.
3. Faucet deck recessed below outside edge of sink.
4. Fuller undercoated.

C. Faucets with Electronic Infrared Sensor:

1. ASME A112.18.1M.
2. Polished chrome plated brass with quarter turn ceramic cartridge valves, unless otherwise noted.
3. Cast brass waterways.
4. Factory standard aerator/silencer discharge, or hose end connection where noted.
5. Polished chrome plated brass handles.

- D. Sensor Operated Flush Valves:
 - 1. ASSE 1037, ASME A112.19.6.
 - 2. Polished chrome brass with vacuum breaker, adjusted to water discharge rate appropriate for fixture. 1.6 gpf.
 - 3. Electronic infrared sensor.
 - 4. Courtesy flush, override button.
 - 5. Chrome plated wall cover plate.
 - 6. ADA compliant.
- E. Fixture Carriers:
 - 1. ASME A112.6.1M.
 - 2. Concealed steel or cast iron, adjustable, for wall mounted plumbing fixtures including water closets, urinals, and lavatories.
 - 3. Threaded fixture studs with nuts and washers.
 - 4. Lugs for floor and wall attachment.
 - 5. Where fixtures are mounted to a masonry or concrete wall, a cast-in-place bracket with hanger bolts is acceptable; submit proposed detail with product data submittal.
- F. Sealant:
 - 1. Manufacturer and Model:
 - 2. Dow Corning 786.
 - 3. General Electric SCS 1702.
 - 4. Pecora 863.
 - 5. Silicone base, sanitary.
- G. Water Closet Seats:
 - 1. White.
 - 2. Solid Plastic.
 - 3. Open front, less cover.
 - 4. Self-sustaining stainless steel hinge with check.
 - 5. Brass bolts.

2.03 FITTINGS, TRIM AND ACCESSORIES

- A. Angle Stops:
 - 1. Connections suitable for fixture served.
 - 2. Quarter turn washerless design with F.I.P. inlet or stuffing box oval handle design with sweat inlet.
- B. Stops Concealed in Wall: Chicago Faucet #770SU, or equal.

- C. Escutcheons: Chrome plated cast brass with set screw.
- D. Fixture Supports: Provide type recommended by fixture manufacturer if support is not specified with fixture.
- E. Finish for exposed fixture trim including faucets, tailpieces, waste piping with traps, escutcheons, stops, water supply pipes and fittings: brass with polished nickel chromium plated finish.

PART 3 - EXECUTION

3. 01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power with the correct characteristics is available.

3. 02 PREPARATION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3. 03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Install components level and plumb.
- C. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900.
- D. Solidly attach fixtures to supporting hardware.

3. 04 ADJUSTING

- A. Adjust stops or valves for intended water flow rate without splashing, noise or overflow.

3. 05 FIXTURE HEIGHTS

- A. Heights listed are above finished floor.
- B. Water Closet: 15 inches to bowl rim.
- C. Urinal: 22 inches to bowl rim.
- D. Lavatory: 31 inches to basin rim.
- E. Water Closet Flush Valves: 11 inches minimum above bowl rim.
- F. Shower Heads:
 - 1. Men and unisex: 72 inches (1.83 M) to discharge.
 - 2. Women: 72 (1.83 M) to discharge.
 - 3. Pre-Teen: 66 inches (1.68 M) to discharge.
- G. Accessible fixtures: In accordance with CABO/ANSI A117.1.

3.06 FIXTURE SCHEDULE

A. Water Closet (P-1A):

1. Description:
 - a. Wall hung, ADA.
 - b. Siphon jet vitreous china closet bowl, with elongated rim 1 ½ inch top stud.
 - c. 1.6 gallon (6.0 lpf).
 - d. Glazed trapway.
2. Model Numbers:
 - a. American Standard Model 2257.103.
 - b. Crane Model 3-446E.
 - c. Eljer Model 111.1505.
 - d. Kohler Model K-4330.
3. Sensor Operated Flush Valve Model:
 - a. Sloan Model 111 ES-S.
 - b. Zurn.
 - c. Delaney.
4. Seat:
 - a. Bemis Model #1955-SSC.
 - b. Beneke Model #523 SS.
 - c. Church Model #9500 NSSC.
 - d. Kohler Model K4670-SC.
 - e. Olsonite Model #95 SS.

B. Lavatory (P-2):

1. Description:
 - a. Solid surface counter with integral bowl.
 - b. Single faucet hole on center.
2. Acceptable Manufacturers and Model Numbers:

<u>Manufacturer</u>	<u>Model</u>	<u>Number</u>
American Standard	Affinity	3420.001
Crane	Sonet	1-283-V Single Hole
Kohler	Farmington	K-2905-1

3. Trim:
 - a. ASME A112-18.1M.
 - b. Chrome plated supply fitting with open grid strainer.
 - c. Water economy aerator.
 - d. Single level handle, (minimum 4-inch long handle).
 - e. Chrome plated 17 gauge brass P-trap and angle valve assemblies.
4. Trim Model Numbers:

<u>Manufacturer</u>	<u>Faucet</u>	<u>Strainer P-trap</u>	<u>Supply/Stop</u>
Bradley	S53-305	----	----
Eljer	----	803-0552	802-0310
Kohler	----	K-7715	K-9009
McGuire	----	ISS-A	8872
Engineered Brass Co.	----	SG7	158
Chicago Faucet	----	TA125	LA10
		----	1028

C. Lavatory (P2A):

1. Description:
 - a. ANSI/ASME A112-19.2M.
 - b. Vitreous china wall hung lavatory (refer to plans for size).
 - c. 4-inch high back.
 - d. Drillings on 4-inch centers.
 - e. Rectangular basin with splash lip.
 - f. Front overflow.
 - g. Soap depression.
2. Acceptable Manufacturer's and Model Numbers:

<u>Manufacturer</u>	<u>Model</u>	<u>No.</u>
American Standard	Handicapped	9141.011
Eljer	Delwyn	051-2644
Crane	Norwich	1-194
Kohler	Kingston	K-2005
3. Trim:
 - a. ASME A112-18.1 M.
 - b. Chrome plated supply fitting with open offset grid strainer.
 - c. Water economy aerator.
 - d. Single lever handle (minimum 4-inch long handle).
 - e. Chrome plated 17-gauge brass P-trap with clean out plug and arm with escutcheon.
 - f. Provide under sink protective pipe cover for P-trap and angle valve assemblies to meet ADA wheelchair accessible requirements. Truebro Lav Guard or equal.

4. Trim Model Numbers:

<u>Manufacturer</u>	<u>Faucet</u>	<u>Strainer P-trap</u>	<u>Supply/Stop</u>
Bradley	S53-309	----	----
Eljer	-----	803-0552	804-1185
Kohler	-----	K-7715	K-9009
McGuire	-----	ISS-A	8872
Engineered Brass Co.	-----	SG7	TA125
Chicago Faucet	-----	-----	LA10 1028

5. Wall Mounted Carrier:

- a. ANSI/ASME A112.6.1M.
- b. Cast iron and steel frame with tubular legs.
- c. Lugs for floor and wall attachment.
- d. Concealed arm supports for non-concrete block walls.
- e. Bearing plate and studs for concrete block walls.

6. Carrier Model Numbers:

- a. Wade Division/Tyler Pipe.
- b. Josam Manufacturing Co..
- c. Jay R. Smith Mfg. Co..
- d. Zurn Industries, Inc.
- e. Use back to back type where applicable.

D. Single Compartment Sink (P-3):

1. Description:

- a. 18-gauge thick stainless steel.
- b. 21 X 15 ¾ X 8-inch deep bowl.
- c. Stainless steel strainer.
- d. 3 ½-inch strainer.

2. Model Numbers:

- a. Elkay LR-2521.
- b. Approved equal.

3. Trim Model Numbers:

- a. Elkay.
 - (1) Faucet: LK-4100.
 - (2) Strainer: LK-35.
- b. Approved equal.

E. Shower Trim (P-4):

1. Description:

- a. Side wall installation.
- b. Supply piping concealed by 18-gauge stainless steel cover.

- c. Vandal-proof hardware.
- d. Pressure-balancing valve with single spindle and pressure actuated piston contained in spindle.
- e. Integral stops.
- f. #4 brush finish.
- g. $\frac{1}{2}$ -inch copper tubing to head mounting on institutional head bracket fitting.

2. Acceptable Manufacturers:
 - a. Symmons Industries, Model Hydrapipe 64 Series.
 - b. Leonard Valve Co., Model Surfshower Series.
 - c. Bradley Corp., Model Bradsole Series.

F. Shower Trim (P-4A):

1. Description:
 - a. Side wall installation.
 - b. Supply piping concealed.
 - c. Vandal-proof hardware.
 - d. Pressure-balancing valve with single spindle and pressure actuated piston contained in spindle.
 - e. Integral stops.
 - f. #4 brush finish.
 - g. Barrier free seat.
 - h. Hand held showerhead with 60" stainless steel flexible hose.
 - i. 24" straight grab bar.
2. Acceptable Manufacturers:
 - a. Symmons Industries.
 - b. Leonard Valve Co.
 - c. Bradley Corp., Model 478 STS.

G. Cupsink (CS):

1. Description:
 - a. Black epoxy.
 - b. 9" X 3" inside dimensions.
2. Model numbers:
 - a. Kewaunee: 0492-BE.
3. Trim Model Numbers:
 - a. Kewaunee:
 - (1) Faucet: Laboratory.
 - (2) Trap polyethylene 1 $\frac{1}{2}$ " outlet – 0464-00.
 - (3) Drain: 0482-BP.

H. Hose Bibb (HB):

1. Description:
 - a. Bronze or brass construction.
 - b. $\frac{3}{4}$ -inch male hose connection.
 - c. Vacuum breaker.
 - d. Loose tee key.
2. Acceptable Manufacturers:

<u>Manufacturers</u>	<u>Model</u>
MIFAB	mhy-9031
Woodford	24P
McDonald	2014

I. Emergency Shower (ES):

1. Description:
 - a. Ceiling mounted.
 - b. 10-inch diameter plastic showerhead.
 - c. Pulls that are wall mounted at ADA accessible heights.
 - d. Ball valve operates by pull of nylon rope with red color ball weight.
2. Acceptable Manufacturers and Model Numbers:

<u>Manufacturers</u>	<u>Model</u>
Haws	8169
Kewaunee	W-0928-00
Approved Equal	

J. Emergency Eyewash (EEW):

1. Description:
 - a. Deck mounted.
 - b. Two gentle spray outlet heads.
 - c. Ball valve and 90° swivel.
2. Acceptable Manufacturers and Model Numbers:

<u>Manufacturer</u>	<u>Model</u>
Kewaunee	W-0931-00 Right hand
Kewaunee	W-0932-00 Left hand
Approved equal	

END OF SECTION 15440

SECTION 15445 – COMPRESSED AIR SYSTEM

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to the work of this section.
- C. Refer to Division 16 sections for the following work; not work of this section.
- D. Power supply wiring from power source to power connection on air compressors and other devices. Include disconnect and required electrical devices, except where specified as furnished, or factory installed by manufacturer.
- E. Interlock wiring between air compressors and field installed control devices.

1. 02 CODES AND STANDARDS

- A. Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide piping materials and factory fabricated piping products of types, sizes, pressure rating, temperature ratings, and capacities indicated. Where not indicated, provide proper selection as determined by Installer to comply with the installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on piping systems maximum design pressures.
- B. Air Piping: Schedule 40 galvanized steel with 150-psi malleable iron fittings unless otherwise notes. Type L copper tubing with wrought copper fittings and silver solder joints (ASTM B-32, Grade 96TS) may be used for runouts to end use devices.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install air piping with 1/32" per foot (1/4% downward slope in the direction of flow).
- B. Locate groups of pipes parallel to each other, spaced to permit servicing of valves. All branches and outlets shall be taken from the top of the main.
- C. Test and clean compressed air piping systems complying with Division 15 section "Testing, Cleaning and Sterilization of Piping Systems."
- D. Check entire assembly for correctness of installation, alignment and control sequencing. Start all component parts in proper sequence. Make all adjustments required to insure proper smooth, quiet operation.

END OF SECTION 15445

SECTION 15446 – CENTRAL VACUUM SYSTEM

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to the work of this section.
- C. Refer to Division 16 sections for the following work; not work of this section.
- D. Power supply wiring from power source to power connection on vacuum pump and other devices. Include disconnect and required electrical devices, except where specified as furnished, or factory installed by manufacturer.
- E. Interlock wiring between vacuum pump and field installed control devices.

1. 02 CODES AND STANDARDS

- A. Provide electric motors and components which are listed and labeled by Underwriters Laboratories and comply with NEMA standards.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide piping materials and factory fabricated piping products of types, sizes, pressure rating, temperature ratings, and capacities indicated. Where not indicated, provide proper selection as determined by Installer to comply with the installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure rating on piping systems maximum design pressures.
- B. Air Piping: Schedule 40 galvanized steel with 150-psi malleable iron fittings unless otherwise notes. Type L copper tubing with wrought copper fittings and silver solder joints (ASTM B-32, Grade 96TS) may be used for runouts to end use devices.

PART 3 - EXECUTION

- A. Install air piping with 1/32" per foot (1/4% downward slope in the direction of flow.
- B. Locate groups of pipes parallel to each other, spaced to permit servicing of valves. All branches and outlets shall be taken from the top of the main.
- C. Test and clean compressed air piping systems complying with Division 15 section "Testing, Cleaning and Sterilization of Piping Systems."

END OF SECTION 15446

SECTION 15459 – DI WATER SYSTEM

PART 1 - GENERAL

1. 01 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Requirements and Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Extent of DI water systems work is indicated on drawings and schedules, and by requirements of this section.

1. 02 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for the following.
 - 1. Piping.
 - 2. Valves.
 - 3. Access Doors.

1. 03 TEST REPORTS AND VERIFICATION SUBMITTALS

- A. Submit report on cleaning and sterilization of piping systems.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Provide DI water system, piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Plumbing Code where applicable. Provide sizes and types matching pipe materials used in DI water systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2. 02 IDENTIFICATION

- A. Provide identification complying with Division 15 Basic Mechanical Materials and Methods section "Mechanical Identification."

2. 03 PIPES AND FITTINGS

- A. Provide pipes and pipe fittings complying with Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings," in accordance with the following listing:
 - 1. Interior Water Piping: Schedule 80 polypropylene pressure rated piping with fused joints.

2.04 PIPING SPECIALTIES

- A. Provide piping specialties complying with Division 15 Basic Mechanical Materials and Methods section – Piping Specialties.

2.05 VALVES

- A. Provide valves in accordance with the following listing:
 1. Sectional and Shutoff Valves: True union polypropylene with Teflon seals, ABS handles and Vitron "O" rings, PPS or equal.
 2. Check Valves: Schedule 80, polypropylene, PPS or equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install mechanical identification in accordance with Division 15 – Basic Mechanical Materials and Methods Section – Mechanical Identification.
- B. Install water distribution piping in accordance with Division 15 – Basic Mechanical Materials and Methods Section – Pipes and Fittings.”
 1. Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
 2. Locate groups of pipes parallel to each other, spaced to permit servicing of valves.
- C. Install piping using 45° ells. Use no 90° ells. Install piping such that dead-legs do not exceed 6 pipe diameters.
- D. Install piping specialties in accordance with Division 15 – Basic Mechanical Materials and Methods Section – Piping Specialties.
- E. Install valves in accordance with Division 15 – Basic Mechanical Materials and Methods Section – Valves.
 1. Shutoff Valves: Install on inlet and outlet of each equipment item and elsewhere as indicated.
 2. Drain Valves: Install on each equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain system.
- F. Piping Tests: Test, clean, and sterilize potable water piping in accordance with testing requirements of Division 15 – Basic Mechanical Materials and Methods Section – Testing, Cleaning, and Sterilization of Piping Systems and system supplier requirements to certify the system. Submit report.

END OF SECTION 15459

SECTION 15730 – UNITARY AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Extent of work required by this section is indicated on drawings, and schedules, and by requirements of this section.
- D. Refer to Division 16 section for the following work; not work of this section.

1. 02 POWER SUPPLY WIRING

- A. Power supply wiring from power source to power connection on unit to be provided by Division 16. Include starter, disconnects, and required electrical devices, except where specified as furnished, or factory installed by manufacturer.

1. 03 CONTROL WIRING

- A. Specified as work of Division 15, Controls and Control wiring is work of this section.

1. 04 CODES AND STANDARDS

- A. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
- B. ARI Compliance: Test and rate air handling units in accordance with ARI 210/240 “Unitary Air Conditioner and Air-Source Unitary Heat Pump”, display certification symbol on units of certified models.
- C. NFPA Compliance: Provide air handling unit internal insulation, adhesives, and coating having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems.”
- D. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA Standards.
- E. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connection of ancillary electrical components of air handling units.
- F. Unit shall exceed ASHRAE 90.1 – 2004 Energy Standards.
- G. Roof curb shall be designed to conform to NRCA Standards.

1.05 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturers' technical product data as follows showing dimensions, weights, capacities, certified ratings, fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions. Submit assembly type drawings showing unit dimensions, weight loadings, required clearances, construction details, and field connection details.
 - 1. Rooftop Air Handling Units.
 - 2. Roof Curbs.
- B. Shop Drawings: Submit shop drawings showing the actual installation of each air handling unit in plan and section. Show coil access, filter access, motor access, controls access and access to any other components requiring service. Show coordination with all related structural components of the building and show all unit supports. Show relationship to drains and other equipment. Show every electrical device and control panel with code-required service clearance clearly marked.

1.06 O&M DATA SUBMITTALS

- A. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to air handling units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.
- B. Maintenance Data: Submit a copy of approved submittals. Submit maintenance instructions, including instructions for lubrication, filter replacement, motor drive replacement, and spare parts lists. Include these data and wiring diagrams in O&M Manual.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide air handling units of one of the following:
 - 1. Carrier Air-Conditioning.
 - 2. McQuay, Inc.
 - 3. Trane Co.
 - 4. York.

2.02 GENERAL

- A. Provide factory fabricated and factory tested packaged rooftop air handling units as indicated, of sizes and capacities as scheduled, and as specified herein.
- B. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117.

2.03 UNIT CABINET

- A. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.
- B. Evaporator fan compartment interior cabinet surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side.
- C. Cabinet panels shall be easily removable for servicing.
- D. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
- E. Unit shall have a factory-installed, sloped condensate drain pan made of a non-corrosive material, providing a minimum 3/4-in.-14 NPT connection with both vertical and horizontal drains, and shall comply with ASHRAE Standard 62.
- F. Unit shall have a factory-installed filter access panel to provide filter access with tool-less removal.
- G. Unit shall have standard thru-the-bottom power connection capability (accessory kit is required).

2.04 COILS

- A. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
- B. Testing:
 1. Evaporator and condenser coils shall be qualified to UL 1995 burst test at 2,200 psi.
 2. Evaporator and condenser coils shall be leak tested to 150 psig and pressure tested to 400 psig.
- C. Corrosion Protection: Provide optional pre-coated aluminum-fin coils that shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

2.05 COMPRESSORS

- A. Fully hermetic type, internally protected scroll type.
- B. Factory mounted on rubber grommets and internally spring mounted for vibration isolation.
- C. Units shall be electrically and mechanically single circuits (one compressor per circuit).

2.06 FANS

A. Evaporator Fan:

1. Fan shall be belt driven as shown on the equipment drawings. Belt drive shall include an adjustable-pitch motor pulley.
2. Fan wheel shall be double-inlet type with forward- curved blades.
3. Bearings shall be sealed, permanently lubricated ball-bearing type for longer life and lower maintenance.
4. Evaporator fan shall be made from steel with a corrosion- resistant finish and shall be dynamically balanced.
5. Condenser fan shall be of the direct-driven (with totally enclosed motors) propeller type and shall discharge air vertically.
6. Condenser fan shall have aluminum blades riveted to corrosion-resistant steel and shall be dynamically balanced.

2.07 REFRIGERANT COMPONENTS

A. Refrigerant circuit components shall include:

1. Fixed orifice metering system.
2. Refrigerant filter drier.
3. Service gage connections on suction, discharge, and liquid lines.

2.08 FILTER SECTION

A. Standard filter section shall consist of factory installed, low velocity, throwaway 2-in. thick fiberglass filters of commercially available sizes.

B. Filter face velocity shall not exceed 320 fpm at nominal airflows.

C. Filter section should use only one size filter.

D. Filters shall be accessible through an access panel with “no-tool” removal.

2.09 CONTROLS AND SAFETIES

A. Unit Controls: Unit shall be complete with self-contained low voltage control circuit protected by a fuse on the 24 volt transformer side.

B. Safeties:

1. Unit shall incorporate a solid-state compressor protector which provides anti-cycle reset capability at the space thermostat, should any of following standard safety devices trip and shut off compressor.
 - a. Compressor overtemperature, overcurrent.
 - b. Loss-of-charge/low-pressure switch.
 - c. Freeze-protection thermostat, evaporator coil.
 - d. High-pressure switch.
 - e. Automatic reset motor thermal overload protector.

The lockout protection shall be easily disconnected at the control board, if necessary.

2.10 OPERATING CHARACTERISTICS

- A. Unit shall be capable of starting and running at 125 F ambient outdoor temperature, meeting maximum load criteria of ARI Standard 210/ 240 or 360 at + 10% voltage.
- B. Compressor with standard controls shall be capable of operation down to 25 F ambient outdoor temperature.

2.11 ELECTRICAL REQUIREMENTS

- A. All unit power wiring shall enter unit cabinet at a single factory-predrilled location.

2.12 MOTORS

- A. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
- B. Evaporator-fan motor shall have permanently lubricated bearings and inherent automatic-reset thermal overload protection. Evaporator motors are designed specifically for Carrier and do NOT have conventional horsepower (HP) ratings listed on the motor nameplate. Motors are designed and qualified in the "air-over" location downstream of the cooling coil and carry a "maximum continuous bhp" rating that is the maximum application bhp rating for the motor; no "safety factors" above that rating may be applied.
- C. Totally enclosed condenser-fan motor shall have permanently lubricated bearings, and inherent automatic-reset thermal overload protection.

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine areas and conditions under which rooftop air handling units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Install rooftop air handling units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

3.02 COORDINATION

- A. Coordinate with other work, including ductwork, floor construction, roof decking, and piping as necessary to interface installation of air handling units with other work. Coordinate with and deliver units to heat pipe manufacturer where required.

3.03 ACCESS

- A. Provide access space around rooftop air handling units for service as indicated, but in no case less than recommended by manufacturer.

3.04 SUPPORT

- A. Install roof top air handling units on factory curb as shown on the drawings.

3.05 ANCHORING

- A. Roof mounted equipment must adhere to current hurricane wind loading codes regarding tie-down and wind resistance.

3.06 ELECTRICAL WIRING

- A. Install electrical devices furnished by manufacturer, but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start up until wiring installation is acceptable to equipment installer.

3.07 PIPING CONNECTIONS

- A. Refer to Division 15 HVAC sections. Provide piping, valves, accessories, gauges and support as indicated. Provide trapped DWV copper condensate drain piping full size from the drain connection and extend independently to disposal point as part of this section's work.

3.08 DUCT CONNECTIONS

- A. Refer to Division 15 Air Distribution sections. Provide ductwork, accessories, and flexible connections as indicated.
- B. Brush out fins on all coils.

3.09 TESTING

- A. Upon completion of installation of rooftop air handling units, start up and operate equipment to demonstrate capability and compliance with requirements. Install final, fixed sheave package. Field correct malfunctioning units, then retest to demonstrate compliance.
- B. Provide one spare set of belts and filters, obtain receipt from Owner that belts and filters have been received.

END OF SECTION 15730

SECTION 15810 – FANS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods section apply to work of this section.
- C. Extent of fan work required by this section as indicated on drawings and schedules, and by requirements of this section.

1. 02 COORDINATION

- A. Refer to Division 15 section “Testing, Adjusting, and Balancing” for balance of fans.
- B. Refer to drawings and schedules for control work required in conjunction with fans.
- C. Refer to Division 16 sections for power supply wiring from power source to power connection on fans. Division 16 work will include starters, disconnects, and required electrical devices, except where specified as furnished, or factory installed, by manufacturer.

1. 03 CODES AND STANDARDS

- A. AMCA Compliance: Provide fans which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.
- B. UL Compliance: Provide fans which are listed by UL and have UL label affixed.

1. 04 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturer’s technical data for fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions. Submit assembly-type drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.
 - 1. Fans

1. 05 O&M DATA SUBMITTALS

- A. Submit maintenance data and parts for each type of fan, accessory, and control. Include these data, a copy of approved submittals, and wiring diagrams in O&M Manual.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Except as otherwise indicated, provide standard prefabricated fans of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation. Provide accessories as listed in the schedule on drawings and as described herein. Motors shall be premium efficiency per Division 15 section "Motors."

2. 02 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements provide fans manufactured by Acme, Greenheck, Loren Cook, Penn or approved equal unless otherwise noted herein.

2. 03 CENTRIFUGAL ROOF EXHAUSTERS

- A. Housing: Provide heavy gauge aluminum weatherproof housing and base with external drip ring to prevent exhaust contaminants from running down the wall.
- B. Fan Wheel: Provide aluminum air foil type, statically and dynamically balanced.
- C. Drive: Provide direct or belt drive as scheduled with pre-lubricated, ball bearing, continuous duty type motors. Provide vibration isolation equipment for entire drive.

2. 04 FAN ACCESSORIES AND FEATURES

- A. Where indicated on the schedule or drawings, provide accessories and features listed herein:
 1. Belt Drive: Belt drives shall include cast iron, variable pitch sheaves, heavy-duty belts, and 1750-rpm motors. The drive shall be adjustable to plus or minus 10% of scheduled flow.
 2. Direct Drive: Direct drives shall have multi-speed motors or speed controllers to achieve scheduled flow.
 3. Bird Screens: Provide bird screen of $\frac{1}{2}$ " mesh aluminum or galvanized steel hardware cloth.
 4. Backdraft Dampers: Provide where indicated aluminum louvered dampers with felt-edged blades and nylon bearings.
 5. Disconnect Switches: Provide factory installed local disconnecting means for all 120-volt fans.
 6. Thermal Overloads: Provide internal thermal overloads.
 7. Interlocks: Fan shall be interlocked as described in Division 15 control sections.

PART 3 - EXECUTION

3. 01 GENERAL

- A. Except as otherwise indicated or specified, install fans in accordance with manufacturer's installation instruction and recognized industry practices to insure that fans serve their intended function.
- B. Coordinate fan work with work of walls and ceilings as necessary for proper interfacing. Framing of openings, caulking and curb installation is not work of this section.
- C. Ductwork: Refer to Division 15 section "Ductwork." Connect ducts to fans in accordance with manufacturer's installation instructions. Provide flexible connections in ductwork at fans.
- D. Install fans on vibration isolation equipment as required. Set level and plumb.
- E. Electrical Wiring: Install electrical devices furnished by manufacturer, but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation equipment of Division 16 sections. Verify proper rotation direction of fan wheels.

END OF SECTION 15810

SECTION 15840 – DUCTWORK

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Extent of HVAC metal ductwork is indicated on drawings and schedules, and by requirements of this section.
- D. Refer to other Division 15 sections for exterior insulation of metal ductwork.
- E. Refer to other Division 15 sections for ductwork accessories.

1. 02 CODES AND STANDARDS

- A. SMACNA: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" 1985 Edition for fabrication and installation of metal ductwork, unless otherwise noted.
- B. NFPA 90A Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems."

1. 03 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for the following:
 - 1. Factory Finished Ductwork.
 - 2. Sealants.
 - 3. Flexible Duct.
 - 4. Spin-In Fittings.
 - 5. Side Take-Off Fittings.

1. 04 SHOP DRAWINGS

- A. Submit scaled layout drawings of HVAC metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.

PART 2 - PRODUCTS

2.01 DUCTWORK MATERIALS

- A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.
- B. Galvanized Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet metal complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations. Stamp gauge and manufacturer's identification on each sheet. Break sheets so that identification is exposed.
- C. Stainless Steel Sheet Metal: All laboratory exhaust system ducts shall be constructed of 18-gauge stainless steel complying with ASTM A 167; Type 316, with No. 1 finish. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

2.02 MISCELLANEOUS DUCTWORK MATERIALS

- A. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
- B. Duct Sealant: Provide non-hardening, non-migrating mastic or liquid elastic, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
- C. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork. For exposed stainless steel ductwork, provide matching stainless steel support materials. For aluminum ductwork, provide matching supports unless materials are electrolytically separated from ductwork.
- D. Flexible Ducts: Provide flexible ductwork with R-value of R-6. The use of flexible ductwork is approved for the connection of supply air duct to air distribution devices. The maximum flexible ductwork length shall not exceed 6'- 0".
 - 1. Construction: Provide reinforced metalized polyester jacket that is tear and puncture resistant, air tight inner core with no fiberglass erosion in the air stream and an encapsulated wire helix. Flexible ductwork shall have a recommended operating pressure of 6" w.g. through a negative operating pressure of 0.75" w.g. Flexible ductwork shall meet the requirements of UL-181, the Florida Energy Code, NFPA 90A and NFPA 90B.
 - 2. Acceptable Manufacturers: Subject to compliance with requirements, provide R-6 flexible ductwork by: Atco 35, Flexmaster 8M-R6 or Thermaflex M-DE R6.

E. Spin-In and Side Take-Off Fittings: Provide round branch run-outs as follows.

1. Supply air diffuser connections shall be conical with damper and one-inch high insulation standoff equal to Crown 3200 DS or Flexmaster CBDE-BO.
2. Return air grille connections shall be straight sided with damper and one-inch high insulation standoff equal to Crown 724-D5 or Flexmaster FLD-BO.
3. Exhaust air grille connections shall be straight sided with damper equal to Crown 724 or Flexmaster FLD.
4. Where duct height does not permit the use of conical spin-in fittings, use low profile side take-off fittings equal to Crown 3300-DS or Flexmaster STOD-BO.

F. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15" change of direction per section. Unless specifically detailed otherwise, use 45" laterals and 45" elbows for branch takeoff connections. Where 90° branches are indicated, provide conical type tees.

2.03 FABRICATION

- A. Shop fabricated ductwork in 4, 8, 10 or 12-ft. lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
- B. Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Constructions Standards," except provide sealant at all joints. Supply duct from air conditioning units and all return and exhaust duct shall be minimum 2" pressure class unless otherwise noted.
- C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with centerline radius equal to 1 ½" times associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.
- D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division 15 section "Ductwork Accessories" for accessory requirements.

2.04 FACTORY FABRICATED LOW PRESSURE DUCTWORK (MAXIMUM 2" W.G.)

- A. Material: Galvanized sheet steel complying with ASTM A 527, lockforming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.
- B. Gauge: 28-gauge minimum for round ducts and fittings, 4" through 8" diameter. 26-gauge minimum 9" through 14", 24-gauge minimum 15" through 26".
- C. Elbows: One-piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

- D. Divided Flow Fittings: 90° tees, constructed with saddle tap spot welded and bonded to duct fitting body.
- E. Acceptable Manufacturers: Subject to compliance with requirements, provide factory fabricated ductwork by Semco Mfg., Inc. or United Sheet Metal Div., United McGill Corp., or approved equal.

PART 3 - EXECUTION

3. 01 GENERAL

- A. Examine areas and conditions under which HVAC metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3. 02 INSTALLATION OF METAL DUCTWORK

- A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight (5% leakage for systems rated 3" and under, 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hanger, and anchors of type which will hold ducts true-to-shape and to prevent buckling.
- B. Supports: Install concrete inserts for support of ductwork in coordination with formwork, as required to avoid delays in work. Install self-drilling screw anchors in prestressed concrete or existing work.
- C. Field Fabrication: Complete fabrication of work at project as necessary to match shop fabricated work and accommodate installation requirements.
- D. Duct sealants along with flange and gaskets shall be applied to all joints and seams regardless of duct pressure class to provide a class "A" seal. Sealant materials and application procedures shall follow recommendation of TABLE 1-2 of the SMACNA Manual. Any evidence of leakage by audible sound, condensation or pressure inside external insulation shall be corrected by resealing.
- E. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally. Avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details, annotations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. In finished and occupied spaces, conceal ductwork from view by locating in mechanical shafts, hollow wall construction or above suspended ceilings, unless specifically noted as "Exposed." Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

- F. Electrical Equipment Spaces: Do not route ductwork through transformer vaults or other electrical equipment spaces and enclosures.
- G. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1 ½". Fasten to duct and substrate. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.
- H. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- I. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards. Fan discharge outlet ducts shall be installed correctly with regard to "system effect" per AMCA Publication 201.

3.03 INSTALLATION OF FLEXIBLE DUCTS

- A. Maximum length: Flexible duct to supply air distribution devices shall not exceed 6'-0"
- B. Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible." Support flexible ducts to eliminate pinching and kinking which restrict flow.
 - 1. Peel back insulation and slide the inner core over the spin-in or diffuser neck, seal with duct sealant and install Panduit strap tightly. Slide insulation back over the inner core and install another Panduit strap over the insulation outer jacket. Tape not acceptable.
 - 2. Seal all exposed edges of fiberglass insulation with glassfab and mastic.

3.04 LEAKAGE TESTS

- A. After each duct system is completed, test for duct leakage in accordance with Sections 3 and 5 of the SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 5% of system design air flow for low pressure systems and less than 1% for systems rated over 3".

3.05 EQUIPMENT CONNECTIONS

- A. Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.
- B. Clean ductwork internally free of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration. Keep ducts closed with poly during construction to prevent contamination by construction dust and debris.

3.06 BALANCING

- A. Refer to Division 15 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

3.07 SYSTEM ADJUSTMENT

- A. Adjust the system to provide functional operation to the extent possible, and leave ready for testing and balancing work. It is not the intent of this section to provide final testing and balancing, but to leave the system operational with a minimum of noise.

END OF SECTION 15840

SECTION 15855 – DUCTWORK ACCESSORIES

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.
- D. Refer to other Division 15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1. 02 CODES AND STANDARDS

- A. SMACNA Compliance: Comply with applicable portions of both SMACNA "HVAC Duct Construction Standards, Metal and Flexible" and "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems."
- B. UL Compliance: Construct, test and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers."
- C. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems" pertaining to installation of ductwork accessories.

1. 03 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions as follows:
 1. Low Pressure Manual Dampers.
 2. Control Dampers.
 3. Fire Dampers.
 4. Duct Access Door.
 5. Flexible Connections.

1. 04 O&M DATA SUBMITTALS

- A. Submit manufacturer's maintenance data including parts lists for fire dampers, smoke dampers. Include this data, product data, and a copy of approved submittals in O&M Manual.

PART 2 - PRODUCTS

2.01 DAMPERS

- A. Low Pressure Manual Dampers: Provide 16-gauge dampers of single blade type (12" maximum blade width) or multi-blade type. Damper blades to be gang operated from a single shaft with nylon or ball bearings on each end. Provide indexed locking quadrant. Parallel or opposed blade style is acceptable. Provide 2" standoff on locking quadrant for externally insulated duct.
- B. Control Dampers: Provide dampers with parallel blades for 2-position control or opposed blades for modulating control. Construct blades of 16-ga. steel. Provide heavy duty molded self-lubricating nylon bearings and ½" diameter steel axles spaced on 9" centers. Provide sponge rubber or felt blade edges. Construct frame of 2" x ½" x 1/8" steel channel for face areas 25 sq. ft. and under; 4 x 1 ¼" x 16 g.a. channel for faces areas over 25-sq. ft. Provide galvanized steel finish with aluminum touch-up. Provide actuator and control connections.
- C. Acceptable Manufacturers: Subject to compliance with requirements, provide dampers by Air Balance, American Warning & Ventilating, Arrow Louver and Damper, Penn Ventilator Co., Ruskin Mfg. Co., or from manufacturer of equipment utilizing damper as an integral component.

2.02 FIRE DAMPERS

- A. Fire Dampers: Provide curtain type fire dampers, UL classified and labeled per UL 555, of types and sizes indicated. Construct casings and blades of galvanized steel. Damper shall not restrict duct free area when open. Dampers shall be rated for dynamic closure under flow and pressure. Provide sleeves and mounting angles. Provide fusible link rated at 160 to 165°F unless otherwise indicated. Provide damper with positive lock in closed position. All dampers shall be spring activated.
Basis of Design:
 1. 1 ½ HR: Ruskin IBD2 – Style B for rectangular, Style CR for round, Style CO for oval.
 2. 1 ½ HR: Ruskin IBDT for transfer grilles in narrow partitions.
 3. 3 HR: Ruskin IBDDD23 – Style for rectangular, Style CR for round, Style CO for oval.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide fire dampers by Air Balancer, Inc., American Warning & Ventilating, Arrow Louver and Damper, Penn Ventilator Co., or Ruskin Mfg. Co.

2.03 TURNING VANES

- A. Provide manufactured or fabricated single wall turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards."

2.04 DUCT ACCESS DOORS

- A. General: Provide duct access doors of size indicated, or as required for duty indicated.
- B. Construction: Construct of same or greater gauge as ductwork served. Provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle type latch for doors 12" high and smaller, 2 handle type latches for larger doors.
- C. Acceptable Manufacturers: Subject to compliance with requirements, provide access doors by Air Balance, Inc., Duro Dyne Corp., Ruskin Mfg. Co, or Ventfabrics, Inc.

2.05 FLEXIBLE CONNECTIONS

- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following: Duro Dyne Corp., Flexaust (The) Co., or Ventfabrics, Inc.

PART 3 - EXECUTION

Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.01 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install balancing dampers at all main duct branches and adjacent to units in return air, outside air and where indicated.
- C. Install control dampers in the outside air duct and return air duct for each air handler.
- D. Install turning vanes in square or rectangular 90° elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
- E. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install at all fire dampers. Opening size shall be per NFPA 90A for servicing fire dampers. Provide label with 1 ½" letters to indicate location of fire protection devices.

- F. Install flexible connections in ductwork such that the clear length of the connector is approximately two inches. Provide thrust restraints as required. Flexible material shall not be so slack as to take a definite concave or convex shape during fan operation.
- G. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.
- H. Install fire dampers within firewalls and floors at locations shown on the mechanical drawings. Install in strict accordance with the manufacturer's printed instructions, NFPA 90A, and UL 555. Basis of design installation is detailed on the drawings.

3.02 FIRE DAMPERS

- A. Notify Engineer/Architect at least 24 hours in advance of ceiling installation or chase closure so that complete fire damper installation can be observed. A copy of the manufacturer's printed installation instructions shall be available at the site.
- B. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories as required to obtain proper operation and leakproof performance.

3.03 ADJUSTING AND CLEANING

- A. Adjusting: Adjust ductwork accessories for proper settings. Install fusible links in fire dampers and adjust for proper action.
- B. Final positioning of manual dampers is specified in Division 15 section "Testing, Adjusting, and Balancing." However, the system shall be left functional with all dampers open or throttled.
- C. Cleaning: Clean factory finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- D. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION 15855

SECTION 15860 – GRILLES, REGISTERS AND CEILING DIFFUSERS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to the work of this section.
- B. Division 15 Basic Mechanical Materials and Methods section apply to work of this section.
- C. Extent of air outlets and inlets is indicated by drawings and schedules, and by requirements of this section.
- D. Refer to other Division 15 sections for ductwork and duct accessories required in conjunction with air outlets and inlets and for balancing of air outlets and inlets; not work of this section.

1. 02 CODES AND STANDARDS

- A. ADC Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ADC 1062 “Certification, Rating, and Test Manual.” Provide air outlets and inlets bearing ADC Certified Rating Seal.
- B. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems.”

1. 03 APPROVED SUBMITTALS

- A. Product Data: Submit manufacturer’s technical product data for air outlets and inlets indicating construction, finish, and mounting details.
- B. Performance Data: For each type of air outlet and inlet furnished, provide aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections, and data as required.

1. 04 O&M DATA SUBMITTALS

- A. Submit cleaning instructions for finishes and spare parts lists. Include this data and a copy of approved submittals in O&M Manual.

PART 2 - PRODUCTS

2. 01 GENERAL

- A. Except as otherwise indicated, provide manufacturer’s standard grilles, registers, and ceiling diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Manufacturers not listed in the following specifications will not be considered for approval unless accepted by addendum prior.

- C. Performance: Provide grilles, registers and ceiling diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device equal to the basis of design.
- D. Ceiling and Wall Compatibility: Provide grilles, registers and diffusers with border styles that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling module or wall with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems and wall which will contain each type of ceiling diffuser, grille, or register.
- E. Appearance: All grilles and registers shall be aluminum construction and all diffusers shall be steel or aluminum construction, unless otherwise noted, with uniform matching appearance for each type of outlet. Ceiling mounted grilles and registers shall be set to be sight tight from the predominant exposure.
- F. Finish: All ceiling mounted grilles, registers, and diffusers shall be furnished with baked-on white enamel. Wall and door mounted grilles and registers shall be finished with clear anodized finish baked white enamel.
- G. Select grilles, registers and ceiling diffusers for NC-25 in all areas.

2. 02 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products by Titus or Metalaire.

PART 3 - EXECUTION

- A. Coordinate installation with ceiling and light fixture installation. Locate ceiling outlets as indicated on architectural Reflected Ceiling Plans. Unless otherwise indicated, locate ceiling outlets in the center of acoustical ceiling modules with sides parallel to the grid.
- B. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
- C. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- D. Set air volumes to values shown on the drawings so that the system is functional. Leave ready for test and balance contractor.
- E. Furnish to Owner three operating keys for each type of outlet and inlet that require them; obtain receipt.

END OF SECTION 15860

SECTION 15895 – CHEMICAL FUME EXHAUST DUCT SYSTEM

PART 1 - GENERAL

1. 01 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification section, apply to work of this section.
- B. Division 15 – Basic Mechanical Materials and Methods sections apply to work of this section.
- C. Extent of chemical fume exhaust system work required by this section is indicated on drawings and by requirements of this section.

1. 02 CODES AND STANDARDS

- A. Comply with NFPA 91 requirements.
- B. Comply with NFPA 45 requirements.

1. 03 APPROVED SUBMITTALS

- A. Shop Drawings: Submit $\frac{1}{4}$ " scale ductwork layout shop drawings showing all duct sizes, transitions, offsets, location, test openings, control devices, equipment connections, and related equipment.

PART 2 - PRODUCTS

2. 01 STAINLESS STEEL DUCTWORK

- A. Provide round or rectangular ductwork as indicated, of type 316 stainless sheet steel. Refer to Division 15 Section – Metal Ductwork. All ductwork, elbows, and angles to 18" diameter shall be 18-gauge.
- B. Refer to other Division 15 sections for Fans, Ductwork Accessories and Air Cleaning Equipment. Coordinate equipment selections for complete ductwork systems.

PART 3 - EXECUTION

3. 01 INSTALLATION

- A. Install chemical fume exhaust ductwork systems as shown on the drawings and in compliance with referenced codes. Comply with requirements of other Division 15 sections that specify duct system components.

3. 02 STAINLESS STEEL DUCTWORK

- A. Continuously weld all joints to provide an air-tight and liquid-tight system; seal class A. All joints shall be chemically treated to remove welding slag. All joints shall be butt-welded. Position longitudinal seams at the top of the duct. Van Stone type connections with chemical resistant gasketing are also acceptable.

3.03 EQUIPMENT CONNECTIONS

- A. Provide flanged and bolted connections at all hoods and fans unless a flexible connection is indicated. Gasket material shall be 1/8" thick, 60-70 durometer, full-face type suitable for the service.

3.04 FLEXIBLE CONNECTIONS

- A. Refer to Division 15 Section – Ductwork Accessories, except make double thickness and seal airtight.
- B. Support ducts sufficiently to place no load on connected equipment and to prevent sagging of ducts.
- C. Cleanouts: Provide cleanouts every 10 feet and at changes in direction in horizontal duct runs, unless accessible from hood or fan connections. Flanged, removable duct sections may be used instead of cleanouts.
- D. Slope all horizontal duct runs without pockets to drain. Provide capped close nipple to permit removal of moisture and condensation.
- E. Taper transitions 5" long for each 1" change in diameter.
- F. Provide ductwork test openings in accessible locations and coordinate with test and balance company. Close test opening with corrosion-resistant plugs suitable for the service.
- G. Testing: Pressure test ductwork as described in Division 15 Section – Metal Ductwork and leave ready for test and balance company. Notify Engineer at least 24 hours in advance of tests. Leakage must be less than 1% of design airflow.

END OF SECTION 15895

SECTION 15985 – TESTING, BALANCING AND COMMISSIONING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1. 01 DESCRIPTION OF WORK

- A. Drawings and provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section. Division 15 Basic Mechanical Materials Sections apply to work of this section.
- B. The Contractor shall procure the services of an independent Test, Balance and Commissioning Agency, which specializes in the balancing, testing and commissioning of heating, ventilating, and air conditioning systems. The Agency shall balance, adjust and test all air moving equipment, air distribution and exhaust systems, and temperature control equipment as herein specified.
- C. The Contractor shall award the test, balance and commissioning contract to the Agency as soon as possible to allow them to schedule their work in cooperation with other trades and meet the completion date.
- D. The Contractor shall accomplish all work per AABC National Standards Manual and NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.
- E. The Contractor shall develop and submit a Commissioning Plan per the SMACNA HVAC Systems Commissioning Manual.

1. 02 QUALITY ASSURANCE

- A. The Agency shall be a member in good standing of The Associated Air Balance Council and provide AABC National Project Certification Performance Guarantee to the Owner.
- B. The Agency shall have a fully staffed office within fifty (50) miles of the site and have been regularly engaged in the testing, balancing and commissioning of heating, ventilating and air conditioning systems.
- C. The Agency shall provide proof that personnel performing work has successfully completed at least five projects of similar size and scope. A complete list of reference projects shall be submitted with the bid.
- D. The Agency shall have a Registered Professional Engineer on its staff.
- E. All instruments used shall be accurately calibrated within six- (6) months of balancing and maintained in good working order. If requested, the test shall be conducted in the presence of the Engineer/Architect and/or his representative.

1. 03 SUBMITTALS

- A. Provide a plan review within thirty (30) days upon receipt of contract. The plan review should include comments and recommendations on any discrepancies which may hinder balancing. This plan review shall be transmitted directly to the Owner.

- B. Submit to the Contractor, equipment start-up forms. After receipt from the Contractor of the submittal date, forms will be transmitted by the Agency to the Contractor for use in equipment start-up. The completed forms will be turned over to the Agency prior to the test and balance phase.
- C. Submit agenda of test procedures for each test procedure for each system, describing balancing standards for the testing, balancing and commissioning of the air conditioning, heating, and ventilating systems for the approval of the Engineer. This agenda shall include all forms for each system and component, with specified data from the project plans and specifications included on the form.

1. 04 GUARANTEE AND REPORTS

- A. Provide AABC National Project Certification Performance Guarantee.
- B. Include an extended warranty of one year after completion of initial test, balance and commissioning work, during which time the Owner, at his discretion, may request a recheck of resetting of any equipment or device listed in this test report.
- C. Provide five-(5) copies of tabulated report in neatly organized typed form on AABC approved forms, within fifteen-(15) working days after completion of the test. Report will include start-up reports and drawings to coincide with the test report. In addition, all commissioning tests will be included in a separate report format.

1. 05 INSPECTIONS AND TESTS

- A. Make inspections of the systems during construction for proper installation of balancing devices and general construction as related to the test and balance work. The number of inspections will vary with size and complexity of the project, but a minimum of two inspections are required: one at 50% completion of project installation, the second at 80% completion of the project installation. A written report of each job visit shall be sent to the Engineer/Architect with copies to the Owner and General Contractor.
- B. A minimum of one after-occupancy inspection shall be made within 90 days of the initial balance. At this time, any minor adjustments shall be made for occupant comfort. Major problems, which will require major readjustments, shall be addressed to the Engineer/Architect prior to any readjustments. Any alterations to the final test and balance report shall be transmitted as a revised report to the Owner/Engineer.
- C. Provide for checking balance during opposite season (if tested in winter, recheck and update data during summer, and vice versa). Report in writing new and revised data collected during opposite season testing.
- D. Provide test openings as required for testing and balancing HVAC systems.
- E. Remove and replace equipment, lights or other items which obstruct testing and balancing operations. Where equipment, lights or other items will interfere with fixture adjustments of the HVAC system, such equipment, lights or other items shall be relocated as directed by the Engineer.

1. 06 AIRFLOW TOLERANCES

- A. The intent of this specification is to balance HVAC systems within the tolerance listed, maintaining the pressure relationships indicated, with a minimum of noise.

- B. Air Handling: The supply air return air and outdoor air quantities shall be balanced within plus or minus 5% of design values.
- C. Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within plus or minus 5% of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within plus or minus 10% of design values.
- D. Ceiling Diffusers, Supply Registers, Return and Exhaust Inlets: Balance to an air quantity within plus or minus 10% of the design values.
- E. Temperature Tolerances:
 - 1. Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within plus or minus 1% of design values.
 - 2. Room Temperatures: Balance systems and controls within plus or minus 2°F of indicated settings.
- F. Pressure Relationships: Where code or design indicates a specific pressure relationship, the pressure relationship shall take precedence over airflow tolerances. Airflow tolerance may need to be held tighter than allowed tolerances to meet pressure relationships. Demonstrate the existence of positive or negative pressure to Engineer and authority having jurisdiction by making direct measurements of room relative pressure and/or flow direction.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

2.02 TEST INSTRUMENTS

- A. Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in manner acceptable to Tester.
- B. Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlines in applicable standards, and as modified or detailed herein.

- C. Test, adjust and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5° wet bulb temperature of maximum summer design condition, and within 10° dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.
- D. Punch List: Prepare a deficiency (punch) list for the Contractor with a copy for the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.
- E. Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standard, modified as required to include all data listed herein.
- F. Patch holes in insulation, ductwork and housing, which have been cut or drilled for test purposes, in manner recommended by original Installer.
- G. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.
- H. Include in TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- I. Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in the test report. The TAB company shall provide technicians and instruments and make any test required by the Engineer during this time period.

3.02 CONTROLS

- A. Check all HVAC controls for proper location, calibration and sequence of operation.
- B. Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.
- C. Check all control valves for complete closure and correct action under all operating conditions.
- D. Check all supply and exhaust system controls.

3.03 AIR BALANCING

- A. Leakage tests on ductwork must have been completed before air balancing.
- B. Set dampers, volume controls and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this.
- C. Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.
- D. Record air terminal velocity after completion of balance work.

- E. Record final grille and register deflection settings if different from that specified on contract drawings.
- F. Record all fan speeds.

3.04 DATA COLLECTION

- A. In addition to the data required for any specified performance test, measure and record the temperatures, pressures, flow rates, and nameplate data for all components listed herein.
- B. It is the intent of this section to record data on balanced systems, under normal operating or design conditions.
- C. Temperatures:
 - 1. Outside dry and wet bulb temperatures.
 - 2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.
 - 3. Refrigerant liquid and suction temperatures.
 - 4. Return and supply air temperatures at coils.
- D. Pressures:
 - 1. Suction and discharge static pressure of each fan.
 - 2. Each refrigerant suction and discharge pressure.
- E. Flow Rates:
 - 1. Flow rate through each fan.
 - 2. Flow rate through each coil.
- F. Nameplate Data:
 - 1. Complete nameplate data for all equipment.
 - 2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

END OF SECTION 15985

DIVISION 16

ELECTRICAL

SECTION 16010 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

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

1.01 DEFINITIONS

- A. “Contract Documents” shall be understood to include the Contract Specifications, Contract Drawings, official addenda, official revision bulletins, and all other official documents.
- B. “Electrical equipment and materials” shall be understood to include all electrical related equipment, apparatus, components, devices, assemblies, materials, accessories, and appurtenances.
- C. “Owner” shall be understood to include the Owner’s Designated Representative.
- D. “Provide” shall be understood as “furnish and install.”

1.02 BASIC REQUIREMENTS

- A. **NOTE – An inventory of Electrical Equipment/Materials is currently in storage at the Project Site. This inventory is new and has been purchased by the Owner under a separate contract. Contractor shall field verify condition and quantity prior to submitting Bid. Refer to Section 01020 – OWNER’S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.**
- B. Contractor’s Charge: It shall be this Contractor’s responsibility to complete the Work of this project as conveyed in these Contract Specifications and on the Contract Drawings.
- C. Site Inspection: Prior to the bid, the Contractor shall thoroughly inspect the Project Site and shall become familiar with project areas and existing site conditions.
- D. Hazardous Materials/Conditions: advise the Owner and Engineer/Architect in writing of any suspected hazardous materials and hazardous conditions discovered during the course of the Work. Make this notification as soon as the discovery is made.
- E. General: Installations shall conform to the requirements of NFPA 70, NFPA 101, and IEEE C2, unless more stringent requirements are indicated herein or elsewhere on the Contract Drawings.

- F. Workmanship: All work must be performed in a neat and workmanlike manner by a licensed journeyman electrician or a certified apprentice working under the direct supervision of a licensed journeyman electrician, and shall present a neat and professional appearance when complete.
- G. Electrical Equipment and Materials: Listed and labeled as defined in NFPA 70, Article 100, by a Nationally Recognized Testing Laboratory meeting the requirements of OSHA 29 CFR 1910.
- H. Electrical Equipment and Materials described in these specifications and on the Contract Drawings establish the minimum standards for quality and style, shall be the basis of the bid, and shall be new unless otherwise indicated as existing.
- I. Electrical Equipment and Materials shall be installed in accordance with the manufacturer's recommendations using the best methods known to the trade.
- J. Onsite Storage: Onsite storage of electrical equipment and materials, and tools will be at the Owner's discretion and the Contractor's risk. The Contractor shall follow the pathways as directed by the Owner for the movement of electrical equipment and materials, and tools in and out of the building, and to and from the project areas. Such pathways will be established by the Owner, and are subject to change at the Owner's discretion.
- K. Delivery, Storage, and Handling: Equipment and materials shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced at the Contractor's expense. Stored items shall be protected from theft.
- L. Maintenance of Work Areas: The Contractor shall maintain all work areas in a neat and orderly fashion. The Contractor shall employ means as necessary including, but not necessarily limited to, dust curtains, to prevent the migration of dust, dirt, and debris from the immediate project areas to other areas accessible to the public and/or other building occupants. The Contractor shall clean all work areas of dust, dirt, and debris at the end of each workday and more frequently if directed to do so by the Owner.
- M. Protection: The Contractor shall make every effort to ensure a safe work environment for his employees, contractors, and agents, and for the public. The Contractor shall follow the applicable requirements and recommendations of OSHA. All exposed energized equipment, components, and wiring shall be shielded from accidental contact by employees, workers and building visitors. In no case shall exposed energized equipment, components, or wiring be left unprotected or unguarded. The Contractor shall provide all warning apparatus and materials required to cordon off the Project Site from those not directly associated with the Project including, but not necessarily limited to, warning tape and barriers, cones, signs, and dust curtains. The placement and erection of warning apparatus and materials shall be coordinated with, and to the satisfaction of the Owner and/or Engineer/Architect.

N. Installations: The Contract Drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the Work and verify all dimensions in the field so that equipment and materials shall be properly located and readily accessible. The Contractor shall sequence, coordinate, and integrate the various elements of electrical equipment and materials and comply with the following:

1. Verify all dimensions by field measurement.
2. Coordinate the installation of electrical equipment and materials with other building systems, features, and components.
3. Sequence, coordinate, and integrate the installation of electrical equipment and materials for efficient flow of the Work.
4. Install electrical equipment and materials to conform with approved submittal data to the greatest extent possible. Conform to the arrangements indicated on these drawings recognizing that portions of the work are shown only in diagrammatic form.
5. Any confusing, conflicting, or unclear information on these drawings shall be referred to the Engineer/Architect prior to the bid for his resolution. By failing to refer confusing, conflicting, or unclear information in the Contract Documents to the Engineer/Architect for his resolution prior to the Bid, the Contractor thereby acknowledges the Contract Documents as error free.
6. In general, install electrical equipment and materials level and plumb, parallel and perpendicular to building lines and features.
7. Install electrical equipment and materials to facilitate servicing and maintenance, and repair or replacement of component parts. To the greatest extent possible, connect electrical equipment for ease of disconnecting with a minimum of interference with other installations.

O. Power Outages: The Contractor shall schedule power outages as required to complete the Work of this Project. The number and duration of power outages shall be kept to an absolute minimum. Power outages must be coordinated and scheduled with the Owner with a minimum of fourteen-(14) calendar days advance notice.

P. Temporary Power and Lighting:

Q. Permits / inspections: Obtain (arrange, apply, pay for, and maintain) and post all required construction permits. Obtain (arrange, apply, and pay for) inspection of all electrical work performed under this Contract.

R. Quality Control: Upon completion of the Work, but prior to the punchlist inspection, the Contractor shall complete the following:

1. General: Verify that all electrical equipment is installed, operational, and fully functional in accordance with the manufacturer's requirements and tolerances.
2. Connections and Terminals: Verify all electrical connectors and terminals have been tightened in accordance with the manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.
3. Receptacles: Test each receptacle for proper polarity and ground connection. Test each ground fault circuit interrupter (GFCI) receptacle for proper operation with both local and remote fault simulations according to manufacturer's written instructions. Replace damaged or defective components and retest.
4. List of Adjustable Circuit Breaker Settings: Submit a word processed, computer generated, itemized listing of all adjustable circuit breakers installed as part of the work of this Project, with their final over-current relay and ground fault relay settings.

S. Facilitate Punchlist Inspection: The Contractor shall make one journeyman electrician available to accompany the Engineer/Architect during the punchlist inspection. The journeyman electrician shall assist the Engineer/Architect including, but not necessarily limited to, the removing of equipment covers to facilitate inspection of equipment interiors. The punchlist inspection shall be scheduled by the Engineer/Architect with a minimum of 7 calendar days advance notice following the Contractor's notification of his successful checkout and testing of the completed installations. During the punchlist inspection, the Engineer/Architect will survey the completed installations for compliance with Contract Requirements. Subsequent to the punchlist inspection, the Engineer/Architect will compile a list of installation deficiencies. The Owner's notification to the Contractor of Final Acceptance will not be issued until all installation deficiencies have been corrected to the satisfaction of the Owner and/or Engineer/Architect.

T. Record Drawings: The Contractor shall maintain at the site a clean undamaged set of blue or black-line white prints of the Contract Drawings. This record set drawings shall be marked to show the actual installation, and where the actual installation varies substantially from the Work as originally shown. Mark whichever drawings are most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Mark record drawings with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

1.04 SUMMARY

- A. This Section includes the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Cutting and patching for electrical construction.
 - 6. Touchup painting.

1.05 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.06 SUBMITTALS

- A. Schedule of Electrical Equipment/Materials: Submit schedule of all Electrical Equipment/Materials including a breakdown of Electrical Equipment/Materials supplied from Owner's existing inventory.

1.07 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.

1.08 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
- B. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

- C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 – PRODUCTS

"Not Used"

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
 1. Exposed: IMC.
 2. Concealed: IMC.
 3. Underground, Single Run: RNC.
 4. Underground, Grouped: RNC.
 5. Connection to Vibrating Equipment: LFMC.
 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Use the following raceways for indoor installations:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: IMC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.03 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
 5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

- G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.04 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Metal-clad cable where concealed in ceilings and gypsum board partitions.
- E. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Armored or nonmetallic sheathed cable where permitted by authorities having jurisdiction and where concealed in ceilings and gypsum board partitions.
- F. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.05 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. 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.

3.06 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.07 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install $\frac{1}{4}$ -inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - (1) Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - (2) Light Steel: Sheet-metal screws.
 - (3) Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.08 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.09 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification
 - 5. Concrete bases.
 - 6. Electrical demolition.
 - 7. Cutting and patching for electrical construction.
 - 8. Touchup painting.

3.11 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16010

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes equipment grounding conductors and bonding. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- B. Comply with NFPA 70.
- C. IEEE Std 81 – Guide.
- D. UL 467 – Electrical Grounding and Bonding Equipment.
- E. UL 486A – Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- F. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.01 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "600 Volt or Less Cable."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 1. Solid Conductors: ASTM B 3.
 2. Assembly of Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.02 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.03 EXOTHERMIC CONNECTIONS

- A. UL 486A.
- B. Process: Exothermic process that produces molecular bonding of connected items.
- C. Approved for exposure or direct burial without degradation.
- D. Use graphite molds of proper size and design for the weld and connected items.
- E. Starting Weld material: Copper oxide and aluminum mixture with a minimum 3 percent tin.
- F. Weld material: Aluminum, copper and iron oxides ignited only by spark ignitor designed for the purpose.
- G. Miscellaneous: Provide tools and other devices required for a complete weld.
- H. All welding material shall be of the same manufacturer.

2.04 WIRE

- A. UL 486A.
- B. Materials: Copper, 98 percent conductivity; insulated copper for all feeders, branch circuits; bonding jumpers and transformer grounds; solid for #10 AWG and smaller, stranded for larger than #10 AWG. See Section 16123 for insulation types.

- C. Foundation Electrodes: Bare, tinned, stranded copper #4/0 AWG.
- D. Grounding Electrode Conductor: Insulated copper, size as indicated.
- E. Counterpoise: Bare, tinned stranded, copper, #3/0 AWG.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.02 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install insulated equipment grounding conductors in all raceways. Terminate each end on suitable lug, bus or bushing.
- C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for voice and data cables.
- D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices including air cleaners and heaters. Bond conductor to each unit and to air duct.
- E. Water Heater Cables: Install a separate equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.
- F. Where expansion joints or telescoping joints occur, provide bonding jumpers.
- G. Where flexible metallic conduit is employed, provide a green insulated grounding jumper installed in the flexible conduit.
- H. Provide grounding bushings on all service and feeder raceways terminating within switchboards, motor control centers, panelboards, cabinets, and all other enclosures. Provide grounding conductors from such bushings to the frame of the enclosure and to the ground bus or equipment grounding strap.
- I. Where paralleled conductors in separate raceways occur, provide grounding conductor in each raceway.

3.02 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- C. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- D. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.03 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. Use exothermic welded connections for connections to structural steel and for underground connections. Install at connections to ground rods and other electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding 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.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

END OF SECTION 16060

SECTION 16075 – ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes identification of electrical systems, equipment, materials and installations. Equipment identification nameplates are required for panelboards, transformers, contactor, systems cabinets, disconnects, enclosed circuit breakers, cable trays, disconnects provided under Division 15, and all electrical equipment.
- B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.
- C. Related Sections: Division 16, Section “Basic Electrical Requirements.”

1.02 REFERENCES

- A. ANSI/IEEE C2 - National Electrical Safety Code.
- B. NFPA 70 (National Fire Protection Association) – National Electrical Code.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with ANSI C2.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer’s standard catalog data for nameplates and markers.
- B. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 2 - PRODUCTS

2.01 IDENTIFICATION PLATES

- A. Engraved, Plastic-Laminated Identification Plates: Engraving stock melamine plastic laminate, 1/16-inch thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners. Edges shall be chamfered. Plates shall be fastened with black finished round head screws or rivets, except motors, or approved non-adhesive metal fasteners. When the nameplate is to be installed on an irregular shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location.

- B. Locations: Refer to each related section for detailed information about plate locations and wording.
- C. Letter Size:
 - 1. Use $\frac{1}{4}$ -inch letters for identifying individual equipment and loads.
 - 2. Use $\frac{1}{2}$ -inch letters for identifying grouped equipment and loads.
 - 3. Use $\frac{3}{4}$ -inch letters for identifying panelboards and cabinets.

2.02 WIRE AND CABLE MARKERS

- A. Wire and Cable Designation Tape Markers: Vinyl or vinyl cloth, self-adhesive, wrap-around, cable/conductor markers with preprinted numbers and letters.
- B. Colored Adhesive Marking Tape: Self-adhesive vinyl tape not less than 7-mils thick by $\frac{3}{4}$ -inch to 2 inches in width.
- C. Locations: Refer to each related section for detailed information about locations and indications.

2.03 UNDERGROUND UTILITY WARNING TAPE

- A. Description: Minimum 4-mils thick, 6-inch wide composition metallized foil-plastic film laminate, detectable type, colored red with suitable permanent, continuous printed, warning legend describing buried electrical lines. Tapes shall be formulated for prolonged use underground.

2.04 JUNCTION AND PULL BOX IDENTIFICATION

- A. Junction boxes, pullboxes and their covers shall be distinctively painted to identify their service. (A convenient way to facilitate this is to spray-paint the boxes and covers in groups before installation.)
- B. Boxes shall be color coded as follows:
 - 1. Purple: 480/277V. Power and Lighting System.
 - 2. Yellow: 120/208V (or 120/240V) power and lighting system.
 - 3. White: Any other system, with system type (such as "intercom" or "public address") marked on covers in black.

2.05 EMPTY CONDUITS

- A. All empty conduits shall be left with pull ropes.
- B. Each end of each pull rope shall be tagged to identify the conduit system and the other end of the pull rope.

- C. Each tag shall contain, but not be limited to, the following information:
 - 1. Conduit system name (e.g. "CCTV").
 - 2. Device for which future connection is planned (e.g. "camera").
 - 3. Location of other end of conduit (e.g. "box in supervisor's office ceiling").

2.06 CABLE TRAYS

- A. Each cable try shall have an engraved plastic nameplate every fifteen (15) feet along its entire length.
- B. Nameplate shall identify the intended use of the cable tray (e.g. "Voice LAN").

2.07 CONDUIT

- A. All conduits (empty and active) shall be identified at wireways, cable trays, panels, pullboxes, cabinets and similar locations to assist in future circuit tracing. Use adhesive markers, Dymo labels or other approved methods.

2.08 CONDUCTORS

- A. All conductors shall be permanently tagged at terminal boxes, equipment and control stations to indicate their function. Feeders shall be identified at every accessible point with a permanent tag indicating circuit number. Conductor tags shall be non-conductive.
- B. Color coding tape shall be moisture, flame and abrasion resistant vinyl plastic tape equal to Scotch No. 35. Colors shall be indicated in Section 16123 – 600 Volt and Less Cable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive plates and markers.

3.02 APPLICATION

- A. Install identification plates parallel to equipment lines.
- B. Install all products in accordance with manufacturer's instructions.

END OF SECTION 16075

SECTION 16112 – SURFACE RACEWAYS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface metal raceways.
- B. Wireways.

1.02 CODES AND STANDARDS

- A. NECA (National Electrical Contractor's Association) Standard of Installation.
- B. NEMA WD-6 – (1998) Wiring Devices Dimensional Requirements.
- C. UL 5 – (1995) Surface Metal Raceways and Fittings.
- D. UL 870 – (1995) Electrical Wireways, Auxiliary Gutters, and Associated Fittings.

1.03 SUBMITTALS

- A. Data Sheets: Submit, as a minimum, the following information on each different type of raceway, multi-outlet assembly, wireway and device. The information may be in the form of manufacturer's data sheets or standard drawings.
 - 1. Type and thickness of metal bases, dividers, and covers.
 - 2. Dimensions.
 - 3. Knockout sizes and locations.
 - 4. Finish.
 - 5. All fittings, device plates, brackets, etc.
 - 6. Wiring devices.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of the raceway, wiring and devices.

1.04 PROJECT RECORD DOCUMENTS

- A. Record actual locations and size of surface raceways, and multi-outlet assemblies and the location and sizes of wireways.

1.05 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include submittal data sheets.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with codes and standards listed in Section 16010 – Basic Electrical Requirements.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated. Product shall bear the UL label.

1.08 FIELD MEASUREMENTS

- A. Verify lengths and mounting heights of raceways.

PART 2 - PRODUCTS

2.01 SURFACE METAL RACEWAY

- A. Manufacturers:

1. Groupe Schneider/Sq-D, Square D Company.
2. Wiremold Co.
3. Substitutions: Approved equal.

- B. Description:

1. UL 5: Surface metal raceway shall be two-piece metal raceway consisting of a base snap-on cover, divider, end caps, entrance fittings, couplings, device mounting brackets, coverplates and other required devices and fittings to provide a completely installed raceway. The base and covers shall be minimum 0.50-inch thick galvanized steel.
2. The raceways shall be capable of being internally divided into 2 separate compartments by means of a metal divider running the full length of the raceway.
3. The base, cover, fittings, etc. shall be UL listed for use as surface metal raceway.
4. Provide surface metal raceways as indicated on Drawings.

5. Finish: The base, covers and all fittings shall be painted with the manufacturer's standard gray enamel finish which shall be capable of being overpainted in the field, unless otherwise indicated on the Drawings.
6. Wiring devices shall be as indicated and specified.
7. Wiring device mounting brackets and coverplates shall be used for all wiring devices mounted in the raceway. Wiring devices shall not be mounted in the raceway cover.
8. Fittings: Furnish raceway manufacturer's standard fittings and accessories.
9. The base shall be mounted to the wall with two screws on approximately 10-inch centers for the length of the base.

2.02 WIREWAY

A. Manufacturers:

1. Austin.
2. Hoffman Engineering Co.
3. Keystone/Rees, Inc.
4. Queen.
5. Groupe Schneider/Square D Co.
6. Wiegmann.
7. Substitutions: Approved Equal.

B. Description:

1. UL 870: Wireway shall be 2-piece, general purpose or raintight type wire for outdoor use with trough and front cover. Trough and cover shall be steel; .053-inch thickness for sizes up to 6-inch; .067-inch thickness for other sizes. Raintight shall have drip shield. Trough shall be mounted to the wall or other supports with two screws on no more than 12-inch on centers for the length of the trough.

C. Knockouts: As required.

D. Size: Per NEC.

E. Cover: Screw cover.

F. Connector: Slip-in or flanged.

- G. Fittings: Provide wireway manufacturer's standard connectors, brackets, end caps, and other required fittings to provide a completely installed wireway.
- H. Finish: Rust inhibiting primer coating with manufacturer's standard gray enamel finish unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install surface raceway and fittings in accordance with manufacturer's instructions.
- B. Use flat-head screws to fasten raceway base or trough to surfaces. Mount plum and level.
- C. Use insulating bushings and hub fitting at conduit connections.
- D. Close ends of wireway and unused conduit openings with manufacturer's standard fittings.
- E. Ground and bond raceway and wireway under provisions of Section 16060 – Grounding and Bonding.

END OF SECTION 16112

SECTION 16123 – 600 VOLT OR LESS CABLE

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes requirements for insulated copper stranded conductors and associated connections for general power and control use at voltages below 600 volts.
- B. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.

1.02 REFERENCES

- A. ASTM (American Society for Testing and Materials) - B3, B8.
- B. NECA (National Electrical Contractors Association) – National Electrical Installation Standards.
- C. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- D. NEMA WC 26 - (1996) Wire and Cable Packaging.
- E. NFPA 70 – (1999) National Electrical Code.
- F. UL 83 - (1991; Rev. through Mar. 1996) Thermoplastic – Insulated Wires and Cables.
- G. UL 486A – (1991; Rev. Oct. 1991) Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- H. UL 510 – (1994) Insulating Tape.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that are Listed and Labeled as defined in NFPA 70, Article 100 and marked for specific types, sizes, and combinations of conductors and connected items.
- B. Comply with NFPA 70. Products shall bear the UL label.
- C. Perform work in accordance with codes and standards listed.
- D. Wire shall be manufactured within 12 months prior to the date of delivery to the site.

1.04 SUBMITTALS

- A. Data Sheets: Submit as a minimum the following information on each different type of wire and connector. The information shall be in the form of manufacturer's standard data sheets or drawings.
 - 1. Wire and cable.
 - 2. Conductor material.
 - 3. Conductor gage or MCM.
 - 4. Solid or stranded conductor.
 - 5. Insulation material.
 - 6. Insulation type designation.
 - 7. Insulation temperature rating.
- B. Wiring Connectors:
 - 1. Connector type.
 - 2. Connector material.
 - 3. Voltage, amperage, and temperature ratings.
 - 4. Conductor size ranges.
 - 5. Tools required.
 - 6. Picture of connector and tools.
 - 7. Manufacturer's installation instructions.
- C. Heat Shrink Material:
 - 1. Type of material.
 - 2. Wall thickness.
 - 3. Voltage and temperature ratings.
 - 4. Conductor size ranges.
 - 5. Tools required.
 - 6. Picture of material and tools.
 - 7. Manufacturer's installation instructions.

D. Insulating Tape:

1. Type of material.
2. Thickness and width.
3. Wire pulling lubricants.
4. Type of material.
5. Types of conductor, insulation and conduit for which it is approved.

E. Megger Test Reports: Indicate values obtained.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Codes and Standards.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cables according to NEMA WC 26.

PART 2 - PRODUCTS

2.01 BUILDING WIRE AND CABLE

A. Description: UL 83, single conductor insulated wire.

1. Conductor: Copper; 98 percent conductivity; solid for 10 AWG or smaller; stranded for larger than 10 AWG as applicable.
2. Insulation Thermoplastic: 600 volts, NFPA 70, Type THHN/THWN, XHHW unless otherwise indicated; 75° C or 90° C.
3. All building wire shall be of the same manufacturer. Do not mix wire of different manufacturer on the same project.
4. General: All wire shall be identified as required by NEC.
5. The insulation on wiring #8 or smaller shall have factory-colored insulation. For wire larger than #8, color-coding shall be colored tape wrapped around the insulation of each wire at each connection, splice and pull box. Each phase conductor of each branch circuit shall be of one color throughout the installation.

6. Color coding shall be as follows:

a. 480/277 Volt; Three Phase System:

- (1) Phase A – Brown.
- (2) Phase B – Orange.
- (3) Phase C – Yellow.
- (4) Neutral – Gray.
- (5) Ground – Green.

b. 208-120 Volt, Three Phase System:

- (1) Phase A – Black.
- (2) Phase B – Red.
- (3) Phase C – Blue.
- (4) Neutral – White.
- (5) Ground – Green.

2.02 CONTROL WIRE

A. Description: UL 83, single conductor insulated wire.

- 1. Conductor: Copper; stranded for all sizes.
- 2. Insulation: Thermoplastic; 600, NFPA 70 Type MTW unless otherwise indicated; 75° C or 90° C as applicable.
- 3. All control wire shall be of the same manufacturer.
- 4. Identification: Control wire shall be color-coded throughout. Each wire shall be identified at each terminal and junction point by permanently attaching wire markers indicated the terminal number, etc. Refer to Section 16075 – Electrical Identification.

2.03 WIRING CONNECTORS

- A. Solderless Spring-Wire Connectors: UL 486A, tool-applied, twist-on type with plastic caps; rated for conductor sizes and material.
- B. Compression Connectors and Taps: Mechanical set screw type or tool-applied crimp type. Split bolt connectors are not acceptable.

2.04 ACCESSORIES

- A. Heat Shrink Material: Heavy wall tubing or caps; UL listed as waterproof.
- B. Insulating Type: Vinyl type; minimum 7-mil; listed for use as primary insulation and splice jacketing on 600 volt wire and cable.
- C. Wire Pulling Lubricants: Compatible with all conductor, insulation and conduit types.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Completely and thoroughly swab raceway where moisture and/or dirt has collected inside before installing wire.
- B. Do not install wire in conduit, raceways, etc. until they are complete and sealed against the entry of moisture and/or debris.

3.02 WIRING METHODS

- A. Concealed Dry Interior Locations: Use only building wire, type THHN/THWN or XHHW insulation, in raceway.
- B. Exposed Dry Interior Locations: Use only building wire, type THHN/THWN or XHHW insulation in raceway.
- C. Above Accessible Ceilings: Use only building wire, type THHN/THWN or XHHW insulation in raceway.
- D. Wet or Damp Interior Locations: Use only building wire type THHN/THWN or XHHW insulation in raceway.
- E. Exterior Locations: Use only building wire, type THHN/THWN or XHHW insulation in raceway.
- F. Underground Installations: Use only building wire, type THHN/THWN or XHHW insulation in raceway.
- G. Remote Control, Alarm and Signal Circuits: Type MTW insulation in raceway.
- H. Use wiring methods in accordance with the appropriate article of NFPA 70.
- I. Connect each circuit of a multi-circuit home run to a different phase.
- J. Do not terminate more than one conductor in a single terminal of a lug or connector.
- K. Leave slack conductor at each connection and splice to allow for future additional connections.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install all wiring in raceways. As standard practice, route control conductors in separate raceways from power conductors. When engineering consideration dictate, control conductors may be routed in power raceway under the following conditions:

1. All conductors must have insulation rated for the highest voltage rated insulation in the raceway.
2. The largest power conductor in the raceway is #4 or smaller.

C. Use conductor not smaller than #12 AWG for power and lighting circuits.

D. Use conductor not smaller than #14 AWG for control circuits.

E. Use #10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 115 feet to the furthest outlet.

F. Use #10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 265 feet to the furthest fixture.

G. Pull all conductors into raceway at the same time.

H. Use suitable wire pulling lubricant.

I. Use a pulling means such as tape, rope, grips, etc. that will not damage the wire, cable or conduit.

J. Neatly train and lace wiring inside boxes, equipment, cabinets, switchboards, and panelboards with nylon tie straps. Three phase circuits shall be grouped by circuit.

K. Clean conductor surfaces before installing lugs and connectors.

L. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

M. Tighten set screws and bolts on connectors according to the manufacturer's torquing requirements.

N. Use compression connectors for copper conductor splices and taps, 8 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of the conductor.

O. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, #10 AWG and smaller.

P. Where splices and taps are made in junction boxes or handholes, etc. below grade, use tool-applied crimp type compression connectors. Insulate the conductors and the connector with heavy wall heat shrink material.

Q. For parallel conductors of a single phase, insure that conductor lengths are equal by actual length comparison before installation.

R. Provide phase testing for proper rotation of all motors.

- S. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
- T. Splices in raceways are not allowed. Splice only in junction or outlet boxes in accessible locations.
- U. Wiring at Outlets: Install conductors at each outlet with at least 6 inches of slack.
- V. Provide green colored conductor insulation for the entire length of the grounding conductors for wire size smaller than #6 AWG..
- W. Provide white colored conductor insulation for the entire length of the neutral conductors for wire size smaller than #6 AWG.

3.04 IDENTIFICATION

- A. Identify wires and cables in accordance with Section 16075 — Electrical Identification.
- B. Refer to Section 16130 for identification of contents of pull and junction boxes.
- C. In pull or junction boxes where there is more than one circuit, identify each conductor with its panel and circuit number or other designation indicated on drawings.

3.05 WIRING TEST

- A. Measure the insulation resistance of all feeder conductors using a "Megger." The test voltage shall be 500 volts. Test the conductor without circuit loads applied. The minimum resistance value shall be 1,000,000 ohms.

3.06 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.

END OF SECTION 16123

SECTION 16130 – RACEWAYS

PART 1 - GENERAL

1. 01 SUMMARY

- A. This Section includes rigid metal conduit, intermediate metal conduit, flexible metal conduit, liquid tight flexible metal conduit, electrical metallic tubing, rigid PVC conduit, fitting and conduit bodies.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 through 16 Specification Sections apply to the work of this Section as if specified herein.

1. 02 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. LFMC: Liquidtight flexible metal conduit.
- D. PVC: Polyvinyl chloride.
- E. RGS: Rigid galvanized steel.
- F. FMC: Flexible metal conduit.
- G. EPT: Electrical polyvinyl chloride tubing.

1. 03 SUBMITTALS

- A. Data Sheets: Submit as a minimum the following information for each type of conduit, conduit body, fitting and attachment device.
 - 1. Conduit.
 - a. Type of material.
 - b. Thickness of material.
 - c. Types of protective coatings on the outside and inside.
 - d. Type of protective coating on threads, if applicable.
 - 2. Conduit Bodies:
 - a. Type of material.
 - b. Type of cover material.
 - c. Type of protective coatings, interior and exterior.
 - d. Type of material for screws and gaskets.
 - 3. Conduit Fittings:
 - a. Type of materials such as bodies, gaskets, seals, etc.
 - b. Threaded.
 - c. Compression or set screw type.
 - d. Liquid tight.
 - e. Concrete tight.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100. Products shall be the UL label.
- B. Comply with NFPA 70.
- C. ANSI C80.1: Rigid Steel Conduit, Zinc Coated.
- D. ANSI C80.3: Electrical Metallic Tubing, Zinc Coated.
- E. ANSI C80.6: Intermediate Metal Conduit (IMC).
- F. ANSI/NEMA FB I: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- G. NECA: "Standard Installations."
- H. NEMA RN 1: Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- I. NEMA TC 2: Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- J. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- K. UL 1: Flexible Metal Conduit.
- L. UL 6: Rigid Metal Conduit.
- M. UL 360: Liquid Tight Flexible Steel Conduit.
- N. UL 514B: Fittings for Conduit and Outlet Boxes.
- O. UL 651: Schedule 40 and 80 Rigid PVC Conduit.
- P. UL 797: Electrical Metallic Tubing.
- Q. UL 886: Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.
- R. UL 1242: Intermediate Metal Conduit.

1.05 COORDINATION

- A. Coordinate layout and installation of raceways, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, communication system, HVAC equipment, fire-suppression system, and partition assemblies.

1.06 DELIVERY STORAGE AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. The threads of rigid steel and IMC shall be protected by factory installed caps.
- C. Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

2. 01 METAL CONDUIT

- A. Rigid Steel Conduit (RSC): ANSI C80.1, RSC shall be threaded, hot dip galvanized inside and outside with a chromate coating outside. Threads shall be zinc coated after cutting. Elbows and nipples shall conform to the same specification.
- B. Intermediate Metal Conduit (IMC): ANSI C80.6, IMC shall be threaded, hot dip or electro-galvanized outside with chromate coating. The inside shall be galvanized or coated with paint, zinc, enamel or other corrosion protection material that also provides a smooth, low friction surface. The threads shall be zinc coated after cutting. Elbows and nipples shall conform to the same specification.
- C. Couplings: Couplings shall be threaded, hot dip or electro-galvanized steel with chromate coating and made by the same manufacturer as the conduit.

2. 02 PVC COATED METAL CONDUIT

- A. Description: NEMA RN 1, conduit shall be rigid steel, hot dip galvanized inside and outside including the threads. The exterior surface shall be treated prior to coating. Both interior and exterior shall be coated with an epoxy acrylic primer. The exterior shall be coated with a minimum 40-mil thick PVC coating. The interior shall be coated with a nominal 2-mil thick urethane coating. The conduit shall be bendable without damage to either the PVC or urethane coating. The threads shall be coated with a nominal 2-mil thick clear urethane coating. Elbows and nipples shall conform to the same specification.
- B. Couplings, Fittings and Conduit Bodies:
 - 1. Couplings shall be galvanized steel and made by the same manufacturer as the conduit.
 - 2. Fittings shall be malleable iron or steel.
 - 3. Conduit bodies shall be copper free cast aluminum or malleable iron with cast covers and stainless steel screws.
 - 4. All couplings, conduit fittings and conduit bodies shall have the same exterior and interior coatings as specified for the conduit.
 - 5. The exterior PVC material shall form a sleeve extending one pipe diameter or 2 inches, whichever is less, from each female opening of couplings, fittings and conduit bodies.
 - 6. Clamps, U-bolts, and other devices used to secure the conduit shall be malleable iron or steel with the same PVC coating as the conduit.
 - 7. Couplings, fittings, and conduit bodies shall be of the same manufacturer as the conduit.

2. 03 FLEXIBLE METAL CONDUIT

- A. Description: UL 1, interlocked galvanized steel.

2.04 LIQUID TIGHT FLEXIBLE METAL CONDUIT

A. Description: UL 360, interlocked galvanized steel with extruded PVC jacket.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3, EMT shall be hot dip or electro-galvanized on the outside with a chromate coating. The interior shall be coated with paint, zinc, enamel or other corrosion protection material that also provides a smooth low friction surface.

2.06 NONMETALLIC CONDUIT

A. Description: PVC; Schedule 40.

B. Fittings: Fittings shall match conduit type and material and shall be provided by the same manufacturer as the conduit.

C. Cement for connections of conduit and fittings shall be approved by the manufacturer of the conduit.

2.07 FITTINGS AND CONDUIT BODIES FOR METAL, EMT AND FLEXIBLE CONDUIT

A. Fittings:

1. All fittings, locknuts, bushings, etc. shall be malleable iron or steel.
2. For RSC or IMC, fittings shall be threaded type.
3. For EMT, fittings shall be compression type.
4. Locknuts shall have sharp edges that bite into the enclosure when tightened.
5. Bushings shall be high temperature plastic, with insulating throats and grounding lugs where applicable.
6. Hub fittings shall be two-piece, liquid-tight with high temperature, plastic, insulating throats.
7. Fittings used in concrete shall be UL listed as concrete tight.
8. Fittings used in exterior and other damp or wet applications shall be UL listed as liquid-tight.
9. Fittings for flexible metal conduit shall have insulated throats and grounding lugs where applicable.
10. Refer to the PVC coated metal conduit and nonmetallic conduit specifications for fittings used with those types of conduit.
11. Sealing bushings shall have molded neoprene sealing ring with predrilled holes for each conductor, PVC coated pressure discs, stainless steel screws and washers and locking ring where applicable.

B. Conduit Bodies: Conduit bodies shall be malleable iron or cast copper-free aluminum. They shall be threaded type with cast cover and solid gasket. Where used in dry interior applications, provide coated steel screws. Where used in exterior or other damp or wet applications, use stainless steel screws. Conduit bodies 1 1/4 inches and larger shall have rollers or wire guards.

- C. Expansion Fittings: Expansion fittings shall be malleable iron or steel with insulator bushing, gaskets, washers, packing, etc. as required to provide a complete unit. Provide a braided copper bonding jumper. The fittings shall be rated for interior or exterior use as applicable.
- D. Seal Fittings: Seal fittings shall be malleable iron or cast aluminum, threaded type with packing, sealing compound, plugs, etc. to provide a complete unit. Fittings shall be rated for interior or exterior use as applicable.
- E. Deflection Fittings: Deflection fittings shall be hot dip galvanized ductile iron, threaded type with molded neoprene outer jacket, tinned braided copper bonding jumper, molded plastic inter sleeve, stainless steel clamping bands, etc. to provide a complete unit. The fitting shall be rated for interior or exterior use as applicable. Where fittings are used below grade, they shall be PVC coated as specified under PVC coated metal conduit fittings.

PART 3 - EXECUTION

3. 01 INSTALLATION

- A. Underground Installation:
 - 1. More Than Five Feet from Foundation Wall: Use rigid nonmetallic conduit.
 - 2. Within Five Feet from Foundation Wall: Use rigid nonmetallic conduit.
 - 3. In or Under Slab on Grade: Use rigid nonmetallic conduit.
- B. Outdoor Locations, Above Grade: Use rigid steel and intermediate metal conduit, and rigid nonmetallic conduit.
- C. Wet and Damp Locations, Above Grade: Use rigid steel and intermediate metal conduit, and rigid nonmetallic conduit.
- D. Dry Locations:
 - 1. Concealed in Concrete or Masonry Construction Above Grade, Columns, Walls and Above Suspended Ceilings: Use rigid steel conduit, intermediate metal conduit, and electrical metallic tubing.
 - 2. Exposed: Use rigid steel, intermediate metal conduit, and electrical metallic tubing.
- E. Locations Subject to Physical Damage: Use rigid steel conduit or intermediate metal conduit.
- F. Corrosive Environments: Use PVC coated rigid steel.
- G. In Refrigerated or Hazardous Areas: Use rigid steel or intermediate metal conduit.
- H. Flexible Metal Conduit: Flexible metal conduit shall be installed for:
 - 1. Connections from the conduit system to recessed lighting fixtures, maximum 6 feet in length.
 - 2. Connections to motors, maximum 2 feet in length.
 - 3. Connections to electrical equipment subject to movement or vibration.

- I. Liquid-Tight Flexible Metal Conduit: Liquid-tight flexible metal conduit shall be installed for:
 - 1. Connections to motor equipment subject to movement or vibration where exposed to rain, spray, or a corrosive atmosphere.
 - 2. Connections to equipment subject to oil or grease.
 - 3. Connections to fire pumps and auxiliary equipment.
- J. General Requirements:
 - 1. Install conduit in accordance with NECA "Standard of Installation" and manufacturer's written instructions.
 - 2. Install nonmetallic conduit in accordance with manufacturer's instructions.
 - 3. Minimum Conduit Size: $\frac{3}{4}$ -inch unless otherwise specified.
 - 4. Verify routing and termination requirements and locations of conduit prior to rough-in.
 - 5. Routing and termination of conduits shall be coordinated with structural, equipment, piping and ductwork to assure accessibility to junction and pull boxes.
 - 6. Conduit routing shown on the drawings is diagrammatic unless otherwise dimensioned. Route conduit as specified and as required. Conduit offsets, risers, junction boxes, pull boxes, and fittings are not necessarily shown; however, provide these as required by the conditions involved and applicable codes for a correct and complete installation.
 - 7. Finished Areas: Conceal conduits below floors, within slabs only where indicated, within walls, within pipe chases, above suspended ceilings, and within other building construction, unless otherwise indicated. Conduits shall be run in floor slabs except where otherwise indicated.
 - 8. Unfinished Areas: Install above floor conduits exposed in areas where pipe chases or suspended ceilings are not indicated or concealing is otherwise impractical, in mechanical and electrical equipment rooms, and other unfinished areas.
 - 9. Install conduits run exposed or concealed above ceilings or in walls in straight, level and plumb lines, parallel with and at right angles with beams, wall, ceilings and other building lines.
 - 10. Route conduit in slabs above grade and in and under slabs on grade from point-to-point or shortest practical path.
 - 11. Arrange conduit supports to prevent misalignment during wiring installation.
 - 12. Support individual conduit using coated steel or malleable two hole conduit straps, lay-in adjustable hangers, clevis hangers, threaded rods with conduit fasteners and split hangers.
 - 13. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits. Each conduit shall be independently attached to the rack.

14. Fasten conduit supports to building structure and surfaces under provisions of Section 16190 – Supporting Devices. Do not fasten conduit supports to mechanical piping or ducts or their supports.
15. Do not support conduit with the tie wire or perforated pipe straps. Remove wire used for temporary supports.
16. Do not cross conduits in slab.
17. Conduit shall be installed a minimum of 12 inches from steam or hot water piping, flues or any other surface with a surface temperature exceeding 104° F (40° C) run in parallel with the conduit, and a minimum of 6 inches where run perpendicular to the conduit. Conduit shall be installed a minimum of 3 inches from cold or chilled water piping.
18. Cut conduit square using saw or pipecutter; ream and de-burr cut ends.
19. Bring conduit to shoulder of fittings; fasten wrench-tight.
20. When threads are cut in rigid steel or intermediate metal conduit in the field, the conduit and fittings shall be made up immediately. If there are any showing, they shall be coated with a corrosion resistant compound approved by the conduit manufacturer.
21. When threads are cut in PVC coated rigid steel conduit in the field, the threads shall be coated immediately with a corrosion resistant compound supplied by the conduit manufacturer. When the PVC coating of the conduit is removed or damaged for any reason, the exposed area shall be coated with a PVC compound supplied by the conduit manufacturer. Follow the manufacturer's instructions in applying compounds.
22. Solvent weld nonmetallic conduit and fittings using cement as approved by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fittings. Allow joint to cure as instructed by the manufacturer.
23. Use conduit hubs or watertight fittings to fasten conduit to metal boxes in damp and wet locations.
24. In general, install no more than equivalent of three 90-degree bends between pull or outlet boxes. For communication conduits, install no more than equivalent of two 90-degree bends between pull or outlet boxes. Make field-made bends and offsets with hickey or conduit bending machine. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2-inch size. Do not install crushed or deformed conduits. Keep the legs of a bend in the same plane and the straight legs of offsets parallel. For banked runs, all bends and offsets shall be parallel.
25. Avoid moisture traps; provide junction box with drain fitting at low point in conduit system.
26. Provide approved adapters when PVC conduits are coupled to metallic conduits.

27. Where PVC is used underground, a PVC coated rigid steel elbow shall be provided at the point where the conduit turns up. The vertical portion of the riser shall be PVC coated rigid steel conduit to a point 6 inches minimum above grade or floor slab.
28. Provide approved fittings that maintain conduit electrical continuity by bonding jumpers or other means to accommodate expansion and deflection where conduit crosses control and expansion joints.
29. Provide seal fittings on all conduits where they rise out of the ground or fill below slabs. If the conduit terminates in a floor mounted metal enclosure such as a switchboard, pull box, etc., provide a sealing bushing with a grounding bushing.
30. Provide seal fittings on all conduits that penetrate exterior walls or to or from interior spaces or other areas where conduit passes from one extreme temperature or moisture situation to another such as walk-in refrigerators, freezers or wash down bays.
31. Install a pull rope in each empty conduit. Pull rope shall be monofilament plastic having a minimum 200-lb. tensile strength. Leave a minimum of 12 inches of slack at each end of the pull line and securely fasten pull rope to conduit.
32. Where conduits rise through floor slabs, curved portions or bends shall not be visible above the finished slab.
33. Support non-concrete encased underground conduits by laying with full length bearing on firm trench bottoms.
34. Support horizontal and vertical runs of conduit at intervals in accordance with the code for the types of conduit used. In addition, support each riser conduit at each building floor level.
35. Prior to wire pulling, use suitable caps to protect installed conduit against entrance of dirt and moisture and blow out or swab out conduits in which moisture or dirt has collected. Free clogged conduits of obstructions.
36. Ground and bond conduit under provisions of Section 16170 - Grounding and Bonding.
37. Identify conduit under provisions of Section 16195 – Electrical Identification.
38. Provide all necessary sleeves for conduits and other electrical items passing through concrete and masonry construction where conduit and other electrical items are not installed prior to concrete beams shall be NPS steel pipe or rigid steel conduit, flush with finished concrete surfaces. Sleeves for all conduits passing through the floor shall be galvanized NPS pipe or galvanized rigid steel conduit extending two inches above finished floor, and flush with slab below.
39. Install conduit to preserve fire and smoke resistance rating of partitions and floors.
40. Route conduit through suitable roof flashing devices. Coordinate with roofing installation.
41. Provide insulating bushings on all feeder conduits.

42. Provide code size pull boxes, in accessible locations, in all conduits where the number and degree of bends exceed the code limitations and every 150 feet maximum for long straight runs.
43. All conduits that are stubbed out below grade shall have a threaded, watertight cap installed on the end.
44. Individual and grouped conduits suspended above accessible ceilings shall be located a sufficient distance above the ceiling to permit the removal of the ceiling tile.
45. Conduits shall be located so as not to hinder access to mechanical and electrical equipment through the ceiling tiles.
46. Exposed suspended conduits shall be located as to provide proper headroom as required by OSHA regulations.
47. Conduit runs shall be complete before conductors are installed in them.
48. Tighten set screws of threadless fittings with suitable tools.
49. Terminations:
 - a. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - b. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
50. 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 of slack at each end of pull wire.
51. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
52. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-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:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Where otherwise required by NFPA 70.
53. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

54. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
55. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

3.02 EXCAVATION AND BACKFILL

- A. Excavate and backfill as required for the electrical work (coordinate with utilities). Cut bottoms of trenches to the proper lines and grades to provide firm and continuous support for the underground electrical work, and to provide 24-inch MINIMUM depth or as required by the NEC if more than 24 inches from finished grade to tops of all exterior underground electrical work. Sheet and brace excavations as required to protect personnel and adjacent structures.
 1. After the underground electrical work has been installed and approved, place all backfill in 8-inch maximum thickness loose layers, and compact each layer to at least the density of the adjacent undisturbed site soil, using pneumatic or other suitable power tampers. Mass backfilling (backfilling without tamping) is prohibited.
 2. Warning tape for buried electrical work: Install detectable warning tape directly over every device by burying tape as close to the surface as possible, but no less than 6 inches beneath finish grade. One strip of warning tape shall be placed parallel and directly above the conduit. Where conduits are banked and the width of the conduit bank is over 12 inches, strips shall be placed parallel, on 12-inch centers, centered directly above the conduit bank. Refer to Section 16195 – Electrical Identification.
- B. Conduits Embedded in Slabs:
 1. Conduits shall be installed in slabs only where indicated.
 2. Install in middle third of the slab thickness where practical, and leave a minimum of 1-inch concrete covers.
 3. Do not stack conduits.
 4. Outside diameter of the conduit shall not exceed 1/3 of the slab thickness.
 5. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 6. Space raceways laterally to prevent voids in the concrete. Conduits shall be spaced no closer than 3 diameters on center except at cabinet locations.
 7. Run conduit larger than 1-inch trade size parallel to or at tight right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.

3.03 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, and finishes 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.

3.04 CLEANING

- A. After completing installation of exposed, factory-finished raceways, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

SECTION 16135 – OUTLET BOXES AND FITTINGS

PART 1 - GENERAL

1. 01 SUMMARY

- A. The work included under this Section consists of furnishing and installing outlet boxes, including all related systems and accessories as shown on the Drawings and hereinafter specified.

1. 02 QUALITY ASSURANCE

- A. Manufacturer: Firms regularly engaged in manufacture of electrical boxes of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. ANSI/NEMA Standards Compliance: Comply with ANSI C 134.1 (NEMA Standards Pub No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports.
- C. Furnish products listed and classified by UL as suitable for purpose specified and indicated. Products shall bear the UL label.

1. 03 SUBMITTALS

- A. Data Sheets: Submit as a minimum the following information on each different type of outlet, floor, pull and junction box. The information shall be in the form of manufacturer's standard data sheet or drawings or shop drawings.
 1. Box material.
 2. Wall or sheet metal thickness.
 3. Dimensions.
 4. Hub or knockout sizes.
 5. Gasket material.
 6. Polished stainless steel cover plate material and thickness.
 7. Picture of the box.

PART 2 - PRODUCTS

2. 01 OUTLET BOXES

- A. Interior Outlet Boxes: UL 514A, provide galvanized flat rolled sheet steel interior outlet wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

- B. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.
- C. Weatherproof Outlet Boxes: Provide corrosion-resistant galvanized or cadmium plated cast-iron weatherproof outlet wiring boxes, of types, shapes and sizes, including depths of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.
- D. Conduit Bodies: Provide galvanized cast-metal conduit bodies, of types, shapes and sizes, to suit respective locations and installation, construct with threaded conduit entrance ends, removable covers, and corrosion-resistant screws.
- E. Bushing, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes to suit respective uses and installation.
- F. At each outlet shown, provide a box of suitable size and construction to serve the purpose properly. Furnish and install plaster rings where required in connection with adjacent plaster finishes where these occur. In unfinished masonry walls furnish and install boxes of such size as to permit their being completely covered by the device plate. Boxes throughout shall be galvanized steel. All unused knockouts in boxes shall be filled or capped before plates or devices are installed.
- G. Outlet boxes for all exposed work shall be of the cast iron type. Provide gasketed cover by box manufacturer. Provide the threaded hubs.
- H. In suspended ceilings for lighting fixtures, use 3-1/2 inch deep octagon box with fixture studs and steel mounting bars, or 4-11/16 inch square box by 2-1/8 inch deep.

2.02 FLOOR BOXES

- A. Floor Boxes: UL 514A, fully adjustable with leveling screws and adjusting rings.
- B. Material: Cast Metal or Formed Steel.
- C. Shape: Rectangular.
- D. Conform to regulatory requirements for concrete-tight floor boxes.
- E. Service Fittings: Refer to Section 16140 – Wiring Devices.

2.03 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA 1, galvanized steel, unless otherwise noted on drawings.
- B. Surface-Mounted Cast Metal Box: NEMA, Type 4; flat-flanged, surface mounted junction.
 - 1. Material: Galvanized cast iron or cast aluminum.
 - 2. Cover: Furnish with ground flange, neoprene gasket and stainless steel cover screws.

C. In-Ground Cast Metal Box: NEMA, Type 6, outside flanged, recessed cover box for flush mounting where indicated:

1. Material: Galvanized cast iron.
2. Cover: Galvanized cast iron cover with neoprene gasket and stainless steel cover screws. Cover shall be smooth for below grade applications and nonskid for flush mounted applications.
3. Cover Legend: As indicated.

PART 3 - EXECUTION

3. 01 INSTALLATION OF ELECTRICAL BOXES

- A. Verify locations of floor boxes and outlets prior to rough-in.
- B. Install electrical boxes complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in compliance with recognized industry practices.
- C. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- D. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
- E. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- F. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.
- G. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.
- H. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Provide electrical connections for installed boxes.
- I. All switch outlets boxes shall be flush with wall mounted top 48" above the floor. All receptacle and communication outlets boxes shall be flush with wall mounted bottom 16" above the floor unless otherwise noted on the Drawings.
- J. In suspended ceilings for fixtures for which the ceiling suspension system does not have sufficient strength to prevent visible deflection of the ceiling surfaces, fixture shall be supported by structural members. Threaded studs driven in by powder charge and provided with either lock washers and nuts or nail type nylon anchors are acceptable in lieu of wood screw, expansion shields or machine screws with the written approval of the Owner. In open overhead spaces, cast metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Where conduit is suspended from the structure with hangers, the hangers shall be attached to raceways on opposite sides of the box and shall be supported with an approved type fastener not more than 24 inches from the box. Fastenings shall not penetrate more than 1-1/2 inches into reinforced-concrete beams or more than 3/4 inches into reinforced concrete joints to prevent contact with main reinforcing steel.

- K. Wall boxes installed flush in common wall shall not be back-to-back. Provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic and fire related walls. Install sound absorption material between boxes and plug nipple connection with duct seal. Thru-wall boxes are NOT permitted.
- L. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- M. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- N. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- O. Inaccessible Ceiling Areas: Install outlet, pull and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- P. Install boxes to preserve fire resistance rating of partitions and other elements.
- Q. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices.
- R. Use flush mounting outlet boxes in finished areas.
- S. Secure flush mounting box to interior wall and partition studs. Flush boxes in partitions of light steel construction shall be supported by bar hangers with 25 mm (1 inch) long studs or metal box mounting brackets. When metal box mounting brackets are used, additional box support shall be provided on the side of the box opposite the bracket. This additional box support shall consist of a 300 mm (12 inch) long section of wall stud, bracketed to the opposite side of the box. Accurately position to allow for surface finish thickness.
- T. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- U. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- V. Use adjustable steel channel fasteners for hung ceiling outlet box. Channel fasteners shall be attached to the main runners or supports. The fastener shall be secured to the tee bar or ceiling support with a screw run through the tee bar or support and the fastener at each point at which it is attached.
- W. Do not fasten boxes to ceiling support wires.
- X. Support boxes to or from the structure independent of conduit, except cast outlet boxes that are connected to two rigid metal conduits both supported within 12 inches of box.
- Y. Use gang box where more than one device is mounted together. Do not use sectional box.
- Z. Use gang box with plaster ring for single device outlets.
- AA. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- BB. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- CC. Set floor boxes level.

DD. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
2. Other Locations: Use surface mounted cast metal box.

EE. All pull boxes and junction boxes shall be identified as to their contents. Boxes for power feeder and branch circuit wiring shall indicate the panel and circuit numbers. Boxes for communication and control wiring shall indicate the system or what the wiring is for. The identification shall be written on the cover in bold characters using a wide tip, black permanent marker.

FF. Provide a pull box every 100 feet of conduit run and whenever an excessive number of bonds necessitates a pull box for ease of wire installation.

GG. Junction boxes shall have only the holes necessary to accommodate the conduit at point of installation. All boxes shall have suitable provisions to secure covers.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment furnished under other Sections.
- B. Coordinate locations and sizes of required access doors.
- C. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate mounting heights of outlet boxes with the device mounting heights indicated on the drawings.
- D. Coordinate mounting heights or outlet boxes with the device mounting heights indicated on the drawings.
- E. Orient boxes to accommodate wiring device orientation.
- F. Align adjacent wall mounted boxes for switches, thermostats and similar devices.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
- H. Position outlet boxes to locate light fixtures as shown on reflected ceiling plan.
- I. Coordinate with architectural, structural and mechanical so that boxes will be accessible.
- J. Provide access panels for junction or pull boxes above inaccessible ceilings or in chases.

3.03 ADJUSTING

- A. Adjust floor box flush with finish material.
- B. Adjust flush mounting outlets to make front flush with finished wall material.
- C. Install knockout closure in unused box opening.

3.04 CLEANING

- A. Clean interior of boxes to remove dust, debris and other material.
- B. Clean exposed surfaces and restore finish where scratched or marred.

END OF SECTION 16135

SECTION 16139 - CABLE TRAYS

PART 1 - GENERAL

1.01 SUMMARY

- A. NOTE – An inventory of Cable Tray is currently in storage at the Project Site. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Cable Tray to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Installation of ALL Cable Tray is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes aluminum cable trays and accessories.
- C. Related Sections include the following:
 - 1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 2. Division 16 Section "Basic Electrical Materials and Methods" for cable tray supports not specified in this Section.
- D. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUBMITTALS

- A. Schedule of Cable Tray: Submit schedule of all Cable Tray including a cost breakdown of Cable Tray supplied from Owner's existing inventory.
- B. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.
- C. Shop Drawings: For each type of cable tray.
 - 1. Show fabrication and installation details of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
 - 2. 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.

- D. Coordination Drawings: Floor plans and sections drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural and mechanical elements. Show the following:
 - E. Product Certificates: For each type of cable tray, signed by product manufacturer.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Provide Cable Tray by Thomas & Betts Corp. to match Owner provided Cable Tray.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- C. Comply with NEMA VE 1, "Metal Cable Tray Systems," if cable tray types specified are defined in the standard.
- D. Comply with NFPA 70.

1.04 COORDINATION

- A. Coordinate layout and installation of cable trays and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.01 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 Thomas & Betts Corporation to match Owner provided Cable Tray.

2.02 MATERIALS AND FINISHES

- A. Cable Trays, Fittings, and Accessories: Aluminum, complying with Aluminum Association's alloy 6063-T6 for rails, rungs, and cable trays, and alloy 5052-H32 or alloy 6061-T6 for fabricated parts.
- B. Cable Trays, Fittings, and Accessories: Stainless steel, Type 304.
- C. Protect steel hardware against corrosion by galvanizing according to ASTM B 633 or cadmium plating according to ASTM B 766.
- D. Fabricate cable tray products with rounded edges and smooth surfaces.

2.03 CABLE TRAY ACCESSORIES

- A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
- B. Barrier Strips: Same materials and finishes as cable tray.
- C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.04 SOURCE QUALITY CONTROL

- A. Perform design and production tests according to NEMA VE 1.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 CABLE TRAY INSTALLATION

- A. Remove burrs and sharp edges from cable trays.
- B. Fasten cable tray supports securely to building structure.
 - 1. Locate and install supports according to NEMA VE 1.
- C. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independently of fittings. Do not carry weight of cable tray on equipment enclosure.
- D. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed 90 feet (27 m). Space connectors and set gaps according to NEMA VE 1.
- E. Make changes in direction and elevation using standard fittings.
- F. Make cable tray connections using standard fittings.
- G. Locate cable tray above piping unless accessibility to cable tray is required or unless otherwise indicated.
- H. Seal penetrations through fire and smoke barriers according to Division 7 Section "Through-Penetration Firestop Systems."
- I. If cable trays are sized for future cables, specify provisions for penetrations with sleeves through fire-rated partitions or use "repairable" firestop sealing material.
- J. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- K. Workspace: Install cable trays with sufficient space to permit access for installing cables.

3.03 CONNECTIONS

- A. Ground cable trays according to manufacturer's written instructions.
- B. 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.

3.04 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 1. Perform the following electrical test and visual and mechanical inspections:
 - a. Visually inspect each cable tray joint and each ground connection for mechanical continuity.
 - b. Measure ground resistance of each system of cable tray from the most remote element to the point where connection is made to service disconnect enclosure grounding terminal. Record resistance in ohms.
 2. Report results in writing.

3.05 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures cable tray is without damage or deterioration at time of Substantial Completion.
- B. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
- C. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.

3.06 CABLE TRAY SCHEDULE

- A. Run Designation:
 1. Type: Ladder.
 2. Material and Finish: Aluminum.
 3. Width: 12 inches.
 4. Cross-Rung Spacing: 8 inches.
 5. Minimum Fitting Radius: 12 inches.
 6. Inside Depth: 5 3/8 inches; does not apply to channel-type cable trays.
 7. Cover Type: None.
 8. NEMA Load/Span Class: 1.5.

END OF SECTION 16139

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1. 01 SUMMARY

- A. This Section includes wall switches, wall dimmers, receptacles, device plates and box covers, floor box service fittings, poke-through service fittings, and photocell switches.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. 02 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. TVSS: Transient voltage surge suppressor.

1. 03 SUBMITTALS

- A. Wall switches:
 1. Grade.
 2. Number of poles.
 3. Single, 3 or 4 way.
 4. Body and handle material.
 5. Color of handle.
 6. Voltage rating.
 7. Ampere rating.
 8. Dimensioned picture of the switch.
- B. Wall Dimmers:
 1. Type of circuitry of dimming, RFI filtering and voltage compensation.
 2. On-Off switch.
 3. Slide control.
 4. Materials for dimmer, plates, etc.
 5. Color.
 6. Voltage rating.
 7. Wattage rating.
 8. Dimensioned picture for the dimmer.

- C. Receptacles:
 - 1. Grade.
 - 2. Number of poles and wires.
 - 3. Grounding type.
 - 4. Material for body and face.
 - 5. NEMA configuration.
 - 6. Voltage rating.
 - 7. Amperage rating.
 - 8. Dimensioned picture of the receptacle.
- D. Floor Mounted Service Fittings:
 - 1. Housing and coverplate material.
 - 2. Device plate material and configuration.
 - 3. Number and types of devices.
 - 4. Pictures of required accessories.
 - 5. Dimensioned picture of the fitting and coverplate.
- E. Photocell Switches:
 - 1. Light sensor type.
 - 2. Housing type.
 - 3. Temperature range.
 - 4. Time delay switch type.
 - 5. Number and ratings of contacts.
 - 6. Footcandle on/off ratings.
- F. Manufacturer's Installation Instructions: Indicate application condition and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of the devices.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100. Product shall bear the UL label.
- B. Comply with NEMA WD 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 WALL SWITCHES

- A. Description: UL 20, Specification Grade, AC only general use snap switch; single or double pole, 3 or 4 ways as indicated.

- B. Body and Handle: Plastic with toggle handle. Handle black color.
- C. Ratings: 120-277 volts, AC, 20 amperes.

2.02 WALL SWITCH WITH PILOT LIGHT

- A. Description: UL 20, heavy-duty AC only general-use snap switch; single or double pole as indicated.
- B. Body and Handle: Plastic with red toggle handle.
- C. Indicator Light: Separate pilot strap with red color lens.
- D. Ratings: 120-277 volts, AC, 20 amperes.

2.03 WALL SWITCHES WITH LIGHTED HANDLE

- A. Description: UL 20, Specification Grade, AC only general-use snap switch; single or double pole, as indicated.
- B. Body and Handle: Plastic with red lighted toggle handle and neon lamp.
- C. Ratings: 120-277 volts, AC 20 amperes.

2.04 WALL DIMMERS

- A. Description: UL 773A, Semiconductor dimmer with RFI filtering and voltage compensating circuitry for incandescent lamps, type as indicated on drawings.
- B. Body and Handle: Plastic with on/off switch and linear slide handle, black color.
- C. Voltage: 120 volts.
- D. Power Rating: Wattage as indicated on the drawings.

2.05 DUPLEX RECEPTACLE

- A. Description: UL 498, Specification Grade, 2 pole, 3 wire, grounding type duplex receptacle.
- B. Device Body: Plastic with nylon face, black color.
- C. Configuration: NEMA 5-20R.
- D. Ratings: 125 volts AC, 20 amperes.

2.06 GROUND FAULT INTERRUPTER RECEPTACLES

- A. Description: UL 943, Specification Grade, 2 pole, 3 wire, grounding type, duplex receptacle, 5 ma sensitivity, feed through type, test and reset buttons.
- B. Device Body: Plastic with plastic or nylon face, black color.
- C. Configuration: NEMA 5-20R.
- D. Ratings: 125 volts AC, 20 Amperes.

2.07 SINGLE RECEPTACLE, 125V

- A. Description: UL 498, Specification Grade, 2 pole, 3 wire, grounding type, simplex receptacle.
- B. Device Body: Plastic with nylon face, black color.

- C. Configuration: NEMA 5-20R.
- D. Ratings: 125 volts AC, 20 Amperes.

2. 08 30A SINGLE RECEPTACLE 125V

- A. Description: UL 498, heavy duty, 2 pole, 3 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, phenolic or urea.
- C. Configuration: NEMA 5-30R.
- D. Ratings: 125 volts AC, 30 amperes.

2. 09 20A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 2 pole, 2 wire, grounding type simplex receptacle.
- B. Device Body: Plastic with brown nylon face.
- C. Configuration: NEMA 6-20R.
- D. Ratings: 250 volt AC, 20 Amperes.

2. 10 30A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 2 pole, 3 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, phenolic or urea.
- C. Configuration: NEMA 6-30R.
- D. Ratings: 250 volts AC, 30 Amperes.

2. 11 50A HEAVY DUTY RECEPTACLE

- A. Description: Heavy duty, 2 pole, 3 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, phenolic or urea.
- C. Configuration: NEMA 6-50R.
- D. Ratings: 250 volts AC, 50 Amperes.

2. 12 20A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire grounding type simplex receptacle.
- B. Device Body: Black Bakelite, phenolic or urea.
- C. Configuration: NEMA 14-20R.
- D. Ratings: 125/250 volts, 20 Amperes.

2. 13 30A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire grounding type simplex receptacle.
- B. Device Body: Black nylon, RTP or urea.

- C. Configuration: NEMA 14-30R.
- D. Ratings: 125/250 volts, 30 Amperes.

2.14 50A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, RTP or urea.
- C. Configuration: NEMA 14-50R.
- D. Ratings: 125/250 volts, 50 Amperes.

2.15 20A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire, grounding type simplex receptacle.
- B. Device Body: Black Bakelite, phenolic or urea.
- C. Configuration: NEMA 15-20R.
- D. Ratings: 250 volts, 20 Amperes.

2.16 30A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, RTP or urea.
- C. Configuration: NEMA 15-30R.
- D. Ratings: 250 volts, 30 Amperes.

2.17 50A HEAVY DUTY RECEPTACLE

- A. Description: UL 498, heavy duty, 3 pole, 4 wire, grounding type simplex receptacle.
- B. Device Body: Black nylon, RTP or urea.
- C. Configuration: NEMA 15-50R.
- D. Ratings: 250 volts, 50 Amperes.

2.18 CLOCK OUTLET

- A. Description: UL 498, Specification Grade, 2 pole, 3-wire grounding type simplex receptacle with stainless steel plate with clock hanger.
- B. Device Body: Plastic with nylon face.
- C. Configuration: NEMA 5-15R.
- D. Ratings: 125 volts, 15 Amperes.

2.19 WALL PLATES

- A. Interior Cover Plate: 302 polished finish stainless steel with beveled edges or raised stamped steel as indicated.

B. Weatherproof Cover Plate: Gasketed cast aluminum with hinged gasketed self closing device cover designed to fit over a type FS outlet box. All springs, screw and other hardware shall be stainless steel. The plate shall be UL listed for wet locations with the cover closed.

2.20 FLOOR/TABLE MOUNTED SERVICE FITTINGS

A. Pedestal Convenience Receptacle Service Fitting:

1. Description:
 - a. Housing: Satin aluminum or stainless corrosion resistant.
 - b. Device Plate: Stainless steel or aluminum corrosion resistant.
 - c. Device Plate Configuration: As indicated.
 - d. Devices: Number and type of devices as indicated.

B. Flush Cover Convenience Receptacle Coverplate:

1. Description:
 - a. Material: Brass.
 - b. Configuration: Duplex flap openings.
 - c. Carpet Flange: Brass.
 - d. Hardware: Brass.

C. Pedestal Telephone or Data Outlet Service Fitting:

1. Description:
 - a. Housing: Satin aluminum.
 - b. Device Plate: Stainless steel or aluminum.
 - c. Device Plate Configuration: Blank or as indicated.
 - d. Accessories: Provide mounting plates and other hardware as required for a completely installed unit.

D. Flush Cover Telephone and Data Outlet Coverplate:

1. Description:
 - a. Material: Brass.
 - b. Configuration: Duplex flap openings.
 - c. Carpet Flange: Brass.
 - d. Hardware: Brass.

E. Flush Cover Plate for Conduit Connection:

1. Description:
 - a. Material: Brass.
 - b. Configuration: 1 inch NPS threaded opening with plug.
 - c. Carpet Flange: Brass.
 - d. Hardware: Brass.

2.21 PHOTOCELL SWITCHES

- A. Description:
 - 1. UL 773A.
 - 2. Cadmium sulfide light sensor.
 - 3. Weatherproof diecast aluminum or polycarbonate housing with an Ultrasonic welded lexan or hermetically sealed glass sensor window, and threaded stem, nut and gasket.
 - 4. Temperature range: -30° F to +140° F.
 - 5. Bimetal time delay switch.
 - 6. Contacts shall be SPST snap action type rated for a minimum of 1800 watts for tungsten lads at 120 volts.
 - 7. Adjustable from approximately one to five candles "on" to approximately 3 to 15-foot candles "off."

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation," NFPA 70 and manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- E. Do not share neutral conductor on load side of dimmers.
- F. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- G. Install plates on switch, receptacle, and blank outlets in finished areas.
- H. Connect wiring devices by wrapping conductor around screw terminal.
- I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and no surface mounted outlets.
- J. Install protective rings on flush cover service fittings.
- K. Arrangement of Devices: Mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- L. Protect devices and assemblies during painting.
- M. Install wall plates when painting is complete.
- N. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.02 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."

3.03 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A.

3.04 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.05 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Extent of supports, anchors, sleeves and seals is indicated on the Drawings and specified in other Electrical sections, or as required by other equipment installation.
- B. Types of supports, anchors, sleeves and seals specified in this section include the following:
 1. Riser clamps.
 2. I-beam clamps.
 3. Two-hole conduit straps.
 4. Round steel rods.
 5. Lead expansion anchors.
 6. Toggle bolts.
 7. Wall and floor seals.

1.02 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than three years.

PART 2 - PRODUCTS

2.01 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices, complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation, and as herein specified.
- B. Supports: Provide supporting devices having the following construction features:
 1. Riser Clamps: Black steel; with two bolts and nuts, and four-inch ears; approximately 510 pounds per 100 units.
 2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.
 3. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.
 4. Two-Hole Conduit Straps: 3/4" strap width; and 2-1/8" between center of screw holes. Strap shall have back plate to hold conduit 1/4" from the wall.
 5. Hexagon Nuts: Galvanized.
 6. Round Steel Rod: Black steel; 3/8" diameter; approximately 30 pounds per 100 feet.

7. Offset Conduit Clamps: Black steel; approximately 200 pounds per 100 units.
8. Anchors: Provide anchors having the following construction features.
 - a. Lead Expansion Anchors: 1/2"; approximately 38 pounds per 100 units.
 - b. Toggle Bolts: Springhead; 3/16" x 4", approximately five pounds per 100 units.

C. Sleeves and Seals: Provide sleeves and seals having the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of sizes required; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

D. Sleeve Channel: 14 gauge minimum galvanized or painted steel with factory punched attachment holes. Nuts, bolts, straps and other accessories shall be designed for use with the channel.

PART 3 - EXECUTION

3. 01 INSTALLATION OF SUPPORTING DEVICES

- A. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation."
- B. Do not fasten support to pipes, ducts, mechanical equipment and conduit.
- C. Do not use tie wire, perforated pipe straps or nylon ties to support conduits.
- D. C-clamps or beam clamps shall have strap or rod-type retainers.
- E. Raceways or pipe straps shall not be welded to steel structures.
- F. In partitions of light steel construction, sheet metal screw may be used.
- G. Load applied to fasteners shall not exceed one-fourth test load.
- H. Fasteners attached to concrete ceiling shall be vibration resistant and shock resistant.
- I. Where raceway, boxes and equipment is supported on gypsum board and studwall, vertical and horizontal bracing in the wall shall be provided to support the weight of the raceway, etc. and to receive the screws.
- J. Obtain permission from Owner before drilling or cutting structural members.
- K. Fabricate support from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- L. Install surface mounted cabinets and panelboards with minimum of four anchors.
- M. In wet and damp locations, use steel channel supports to stand cabinets and panelboards one inch off wall.

- N. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use precast insert system, expansion anchors, powder-actuated anchors and preset inserts as applicable.
 - 2. Steel Structural Elements: Use beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners as applicable.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
 - 5. Solid Masonry Walls: Use expansion anchors and preset inserts.
 - 6. Sheet Metal: Use sheet metal screws.
 - 7. Wood Elements: Use wood screws.
- O. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
- P. Install hangers, supports, clamps and attachments to support conduit properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Provide 25 percent space for future use.

END OF SECTION 16190

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1. 01 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Service disconnecting means.
 - 2. Feeder and branch-circuit protection.
 - 3. Motor and equipment disconnecting means.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. Related Sections include the following:
 - 1. Division 16 Section "Wiring Devices" for attachment plugs, receptacles, and toggle switches used for disconnecting means.
 - 2. Division 16 Section "Fuses" for fusible devices.

1. 02 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

1. 03 SUBMITTALS

- A. Data Sheets: Submit as a minimum the following information on each different disconnect switch. The information shall be in the form of the manufacturer's standard data sheets.
 - 1. Voltage rating.
 - 2. Ampere rating.
 - 3. Horsepower rating.
 - 4. Number of poles.
 - 5. Switch and contact materials.
 - 6. Fuseclips.
 - 7. Fuse type and ratings.
 - 8. Handle; interlock and padlocking provisions.
 - 9. Enclosure type.
 - 10. Enclosure materials and finish.
 - 11. Dimensioned picture or drawing of the switch.

- B. Manufacturer's Instructions: Indicate application conditions and limitations for use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of the switch.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100. Products shall bear the UL label.
- B. Comply with NEMA AB 1 and NEMA KS 1.
- 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.

1.05 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.

PART 2 - PRODUCTS

2.01 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, 600 volt, Type HD, horsepower rated, load interrupter enclosed knife switch with high conductivity copper current carrying parts, silver-tungsten type contact surfaces and externally operable handle interlocked to prevent opening front cover with switch ON position. Handle lockable in OFF position with two padlock provisions. Fuse clips: Positive pressure reinforced designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, 600 volt, Type HD, horsepower rated, load interrupter enclosed knife switch with conductivity copper current carrying parts, silver-tungsten type contact surfaces and externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position with two padlock provisions.
- C. Ratings: The number of poles, switch ampere rating (Minimum size is 30A/3P) and fuse ampere rating shall be as indicated.
- D. Fuses: UL Class RK1 unless otherwise indicated.
- E. Enclosures: Surface mounted, code gauge steel with manufacturer's standard gray enamel finish.
 1. Interior Dry Locations: NEMA Type 1.
 2. Exterior Locations: NEMA Type 3R.

2.02 ENCLOSURE CIRCUIT BREAKERS

- A. 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; let-through ratings less than NEMA FU 1, RK-5.
 - 5. Molded-Case Switch: Molded-case circuit breaker without trip units.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Compression style suitable for number, size, trip ratings, and material of conductors.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.03 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 - 3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.04 FACTORY FINISHES

- A. Specify field-painting requirements in Division 9 Sections. Verify compatibility of factory finishes with field-applied coats.
- B. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3. 01 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3. 02 INSTALLATION

- A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3. 03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."
- B. Enclosure Nameplates: Identify each disconnect switch by attaching a laminated plastic nameplate cover to the drive which is clearly and permanently lettered with the description and location of the equipment controlled by the device and the circuit number and origin from which it is fed. The nameplate shall be black with $\frac{1}{4}$ -inch minimum high white characters.

3. 04 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main grounding bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. 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.

3. 05 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 - 2. Test continuity of each line- and load-side circuit.
- B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.06 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.07 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16410

SECTION 16442 – PANELBOARDS

PART 1 - GENERAL

1. 01 SUMMARY

- A. This Section includes panelboard, overcurrent protective devices and associated auxiliary equipment rated 600 V and less.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. 02 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient voltage surge suppressor.

1. 03 SUBMITTALS

- A. Data Sheets: Submit as a minimum the following information on each circuit breaker:
 1. Voltage rating.
 2. Ampere rating.
 3. Number of poles.
 4. AIC rating.
 5. Manufacturer's data sheets.
 6. Dimensions.

1. 04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100. Products shall bear the UL label.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1. 05 COORDINATION

- A. Coordinate circuit breaker types with existing panelboards.

PART 2 - PRODUCTS

2.01 CIRCUIT BREAKERS

- A. Circuit breakers shall be as specified and of the types as listed below.
- B. Circuit breaker shall have voltage, current, pole and interrupting ratings as indicated. Circuit breakers shall be fully rated.
- C. Molded Case Circuit Breakers: NEMA AB1, bolt-on type, automatic, integral thermal and instantaneous magnetic trip in each pole with common trip handle for all poles. Single pole breakers with field installed handle ties are not acceptable. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupted circuit breakers where scheduled. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Do not use tandem circuit breakers.
- D. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, bolt-on type circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting element in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- E. Electronic Molded Case Circuit Breakers: NEMA AB1, bolt-on type with integral microprocessor based trip system, current rating plugs and adjustment panel.
- F. Provide circuit breaker accessory trip units and auxiliary switches as indicated.

2.02 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Circuit breakers shall be compatible with existing panelboards.

3.02 ADJUSTING

- A. Set field-adjustable switches and circuit breaker trip ranges.

3.03 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

SECTION 16491 – FUSES

PART 1 - GENERAL

1. 01 SUMMARY

- A. This Section includes cartridge fuses, rated 600 V and less, for use in switches, controllers, and motor-control centers; and spare fuse cabinets.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. 02 SUBMITTALS

- A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings for each fuse type indicated.
- B. Product Data: Include the following for each fuse type indicated:
 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 2. Let-through current curves for fuses with current-limiting characteristics.
 3. Time-current curves, coordination charts and tables, and related data.
 4. Fuse size for elevator feeders and elevator disconnect switches.
- C. Ambient Temperature Adjustment Information. If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses adjusted.
 1. For each adjusted fuse, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
- D. Maintenance Data: For tripping devices to include in maintenance manuals specified in Division 1.

1. 03 QUALITY ASSURANCE

- A. Source Limitations: Provide fuses from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- C. Comply with NEMA FU 1.
- D. Comply with NFPA 70.

1. 04 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40° F (4.4° C) or more than 100° F (38° C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1. 05 COORDINATION

- A. Coordinate fuse ratings with HVAC and refrigeration equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS

2. 01 FUSES REQUIREMENTS

- A. Description: Nonrenewable, dual element, cartridge type; UL, Class as specified or indicated.
- B. Amperage: As indicated.
- C. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage indicated.
- D. Fuses up to 600 amperes: UL Class RK1 time delay, current limiting type, 200,000 A.I.C unless otherwise indicated.
- E. All fuses shall be of the same manufacturer.

2. 02 EXTRA MATERIALS

- A. Provide three of each size and type fuse installed.

PART 3 - EXECUTION

3. 01 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3. 02 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare fuses in fuse cabinet.

3. 03 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16491

SECTION 16501 - LAMPS

PART 1 - GENERAL

1. 01 SUMMARY

- A. The work included under this Section consists of furnishing and installing the lamps, including all related systems and accessories, as shown on the Drawings and hereinafter specified.

PART 2 - PRODUCTS

2. 01 MATERIALS

- A. Fluorescent lamps shall be rapid start, energy-saving type, with a rated life of 20,000 hours at three (3) hours per start, nominal 32 watt lamps. All lamps shall be 3500°K.
- B. Metal halide lamps shall be clear with a rated life of 20,000 hours. Color temperature shall be 4100 Kelvin and minimum color rendering index shall be 75 CRI. Lamps shall be operated through a ballast designed to the lamp wattage and supply voltage as indicated on the Drawings.
- C. All incandescent lamps shall be 130V, inside frosted unless otherwise specified.

PART 3 - EXECUTION

3. 01 INSTALLATION

- A. Lamps installed in lighting fixtures shall be as specified in the fixture schedule on the Drawings and as specified herein. All lamps shall be operating at the time of final inspection.
- B. At the time of Substantial completion, replace lamps in all lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Owner. Furnish stock or replacement lamps amounting to 20% (but not less than one lamp in each case) of each type and size lamp used in each type fixture. Deliver replacement stock as directed by the Owner to designated storage space.

END OF SECTION 16501



SECTION 16511 - INTERIOR LIGHTING

PART 1 - GENERAL

1. 01 SUMMARY

- A. NOTE – An inventory of Light Fixtures is currently in storage at the Project Site. This inventory is new and has been purchased by the Owner under a separate contract.
 - 1. Coordinate the requirements of this Section with the Owner for providing additional Light Fixtures to complete this Project. Refer to Section 01020 – OWNER'S ALLOWANCE for requirements regarding payment of additional materials required to complete this Work.
 - 2. Installation of ALL Light Fixtures is included under the Work of this Section whether using existing inventory or newly furnished.
- B. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, exit signs, emergency lighting units, and accessories.
- C. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- D. Related Sections include the following:
 - 1. Division 16 Section "Lighting Control Equipment" for programmable lighting control systems, time switches, additional photoelectric relays, power relays, and contactors.

1. 02 SUBMITTALS

- A. Schedule of Light Fixtures: Submit schedule of all Light Fixtures including a cost breakdown of Light Fixtures supplied from Owner's existing inventory.
- B. Product Data: For each type of lighting fixture indicated including ballasts and lamps, arranged in order of fixture designation. The information shall be in the form of the manufacturer's standard data sheets. Include data on features, accessories, and the following:
 - 1. Lighting Fixtures:
 - a. Manufacturer's series or catalog number.
 - b. Dimensioned picture or drawings.
 - c. Material of housings, brackets, etc.
 - d. Finish.
 - e. Ballast type.

- f. Lamp type.
- g. Voltage.
- h. Lens material, thickness and pattern.
- i. Louver or reflector material, depth, number of cells and finish.
- j. Mounting hardware.
- k. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings, photometric data and coefficient of utilization tables.

2. Ballasts:

- a. Manufacturer's series or catalog number.
- b. Ballast type.
- c. Voltage.
- d. Power factor.
- e. Crest factor.
- f. Harmonic factor.

3. Emergency Lighting Units:

- a. Manufacturer's series or catalog number.
- b. Dimensioned picture on drawing.
- c. Housing material and finish.
- d. Battery type and rated life.
- e. AC and DC voltages.
- f. Charger type and charging modes.
- g. Fixture and lamp type.
- h. Test switch and indicator lights.
- i. Control circuitry.
- j. Photometric for lamps.

4. Exit Signs:

- a. Manufacturer's series or catalog number.
- b. Dimensioned picture or drawing.
- c. Housing material and finish.
- d. Lens material and character size.
- e. Battery type and rated life.
- f. AC and DC voltage.
- g. Charger type and charging modes.
- h. Lamp type.

- i. Test switch and indicator lights.
- j. Control circuitry.

5. Lamps:

- a. Manufacturer's series or catalog number.
- b. Picture or drawings.
- c. Lamp designations.
- d. Base or pin type.
- e. Voltage.
- f. Starting mode.
- g. Burning temperature.
- h. Color rendering index.
- i. Diffuser coatings and reflectors.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

D. Manufacturer's Instruction: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Coordination Drawings: Coordinating fixture installation with ceiling grid, ceiling-mounted items, and other components in the vicinity. Include work of all trades that is to be installed near lighting fixtures.

F. Product Certificates: Signed by manufacturers of lighting fixtures certifying that products comply with requirements.

G. Dimming Ballast Compatibility Certificates: Signed by manufacturer of ballast certifying that ballasts are compatible with dimming systems and equipment with which they are used.

1.03 QUALITY ASSURANCE

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100. Products shall bear UL label.
- B. Comply with NFPA 70.
- C. FM Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.04 COORDINATION

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.05 WARRANTY

- A. When warranties are required, verify with Owner's counsel that special warranties stated in this Article are not less than remedies available to Owner under prevailing local laws. Coordinate with Division 1 Section "Warranties."
- B. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

- A. Provide fixtures as specified on the drawings.
- B. Install ballasts, lamps and specified accessories at the factory.

2.02 FLUORESCENT LAMP BALLASTS

- A. Fluorescent Ballast:
 1. UL 935.
 2. Class P, high power factor type electronic ballast.
 3. Provide ballast suitable for lamps specified.
 4. Voltage: As indicated.
 5. Source Quality Control: Certify ballast design and construction by Certified Manufacturers, Inc.
 6. Total Harmonic Distortion: Less than 10%.
- B. Compact Fluorescent Ballast:
 1. UL 935.
 2. Type: Electronic, fully encapsulated in potting compound.
 3. Power Factor: 90 percent, minimum, high power factor type.
 4. Operating Frequency: 20 kHz or higher.
 5. Flicker: Less than 5 percent.
 6. Lamp Current Crest Factor: Less than 1.7.
 7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 8. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 9. Ballast Coil Temperature: 65°C, maximum.

2.03 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with UL 1029 and ANSI C82.4. Unless otherwise indicated, features include the following:
 1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
 2. Operating Voltage: Match system voltage.
 3. Minimum Starting Temperature: Minus 22°F (Minus 30°C) for single lamp ballasts.
 4. Normal Ambient Operating Temperature: 104°F (40°C).
 5. Open-circuit operation that will not reduce average life.
 6. Auxiliary, Instant-on, Quartz System (where indicated): Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
 7. Provide ballast suitable for lamp specified.
- B. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.
- C. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90°C.

2.04 EMERGENCY LIGHTING UNITS AND EXIT SIGNS

- A. Provide emergency lighting units and exit signs as specified on the drawings.

2.05 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section Supporting Devices for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Twin-Stem Hangers: Two, 5/8-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- D. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- E. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Install the fixtures where indicated, but make adjustments using the same number of fixtures in accordance with the Architectural reflected ceiling plan where ceilings exist and verified to be compatible with system.
- C. Where suspended ceilings are involved, coordinate recessed fixture types and trims with actual installed ceiling system, and provide all necessary frames and trim to properly complete each particular installation.
- D. Support luminaires independent of ceiling framing.
- E. Install wall mounted fixtures, emergency lighting units and exit signs at height indicated on drawings.
- F. Install accessories furnished with each fixture.
- G. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture.
- H. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.
- I. Install specified lamps in each fixture, emergency lighting unit and exit sign.
- J. Recessed lay-in type fluorescent fixtures shall be secured to the ceiling tee bar by running a self-tapping screw through the vertical part of the tee bar main runners only and the fixture at each of the four corners of the fixture. In addition, support the fixture from the structure above with four 12-gauge steel wires attached to the fixture at each corner.
- K. Surface and wall mounted fixtures shall be secured with a minimum of four bolts or screws. Do not use clips or fasteners. The bolts or screws shall be run through or into a structural member, slab, stud or other support added for this purpose. Do not secure or support the weight of the fixtures from gypsum board on wall or any ceiling material. Fixtures attached to ceiling tees shall be attached to the main runners only with at least two positive clamping devices such as U-bolts. Rotational spring catches or other clips shall not be used. A 12-gauge steel wire shall be attached to each clamping device and to the structure above.
- L. Surface and wall mounted fixtures larger than 8 inches in any dimension or weights more than 40 lbs. shall be supported independently of the outlet box and secured with a minimum of four bolts or screws. Do not use clips or fasteners. The bolts or screws shall be run through or into a structural member, concrete or masonry wall, or ceiling support member, stud or other support added for this purpose. Do not secure or support the weight of the fixtures from gypsum board on wall or any ceiling material. Smaller fixtures shall be supported from the outlet box and secured with a minimum of two screws. The outlet box shall be secured as specified in Section 16135 – Outlet Boxes and Fittings. Fixtures attached to ceiling tees shall be attached to the main runners only with at least two positive clamping devices. Rotational spring catches or other clips shall not be used.
- M. Where fluorescent fixtures are suspended with chain hangers, the hangers shall be secured to the fixture and the structure with screws or bolts. Do not use clips or fasteners.

- N. Recessed flanged type fluorescent fixtures shall be secured using adjustable swing-gate type hangers that fit over the ceiling support member around the opening and adjusted to secure the fixture and a minimum of four hangers shall be provided for each fixture. A self-tapping screw shall be run through the end cap of the fixture and the vertical part of the ceiling framing at each of the four corners of the fixture. The addition, support the fixture from the structure above with 12-gauge steel attached to the fixture at diagonally opposite corners.
- O. Recessed incandescent, compact fluorescent and H.I.D. fixtures installed in lay-in-type ceiling shall be supported from tee bar system using suspension bar hangers designed for the purpose that fasten to the vertical part of the tee bar. Support the fixture from the main runners only. Do not secure to or support the weight of the fixture from the ceiling material. Secure the bar hanger to the tee by running a self-tapping screw through the vertical part of the ceiling tee and the fastener on each end of the bar hanger. In addition, support the fixture from the structure above with one 12-gauge steel wire attached to the fixture at a point as near to the center as possible.
- P. Recessed incandescent, compact fluorescent and H.I.D. fixtures installed in non-lay-in type ceiling shall be supported from the ceiling support system using suspension bar hangers designed for the purpose that fasten to the support system. Do not secure to or support the weight of the fixture from the ceiling material. Secure the bar hanger to the support system by running a self-tapping screw through the vertical part of the ceiling support and the fastener on each end of the bar hanger. In addition, support the fixture from the structure above with one 12-gauge steel wire attached to the fixture at a point as near to the center as possible.
- Q. Fixtures recessed in walls shall be secured with a minimum of four bolts or screws. Do not use clips or fasteners. The bolts or screws shall be run through or into a structural member, stud or other support added for this purpose. Do not secure or support the weight of the fixture from the gypsum board on walls. Provide two screws on opposite sides of top and bottom or fixture.
- R. Exit signs shall be secured to an outlet box with a minimum of two screws. The outlet box shall be secured as specified in Section 16135 – Outlet Boxes and Fittings.
- S. Undercabinet fluorescent fixtures shall be secured to the underside of millwork with screws installed on 12-inch centers for the length of the fixture.

3.02 CONNECTIONS

- A. Ground equipment.
 - 1. 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.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Advance Notice: Give dates and times for field tests.

- C. Provide instruments to make and record test results.
- D. Tests: As follows:
 - 1. Verify normal operation of each fixture after installation.
 - 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
 - 3. Verify normal transfer to battery source and retransfer to normal.
 - 4. Report results in writing.
- E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- F. Corrosive Fixtures: Replace during warranty period.

3.04 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Remove dirt and debris from enclosure.
- C. Adjust aimable fixtures to provide required light intensities.
- D. Adjust exit sign directional arrows as indicated.

END OF SECTION 16511