NOTICE INVITING SEALED BIDS
West Campus Men’s Gym Locker Area Remodel

Sealed Bids will be received until 3:00 P.M. (Tucson Time), May 27, 2015, by Pima County Community College District ("Owner"), to do the work required for the Owner's Project known as West Campus Men's Gym Locker Area Remodel ("Project"), which is located in Pima County, Arizona.

A MANDATORY Pre-Bid Conference will be held May 13, 2015 at 10:00 a.m. (Tucson Time) at the following location:

Pima Community College West Campus
2202 W. Anklam Rd.
Tucson, AZ 85709
Gym 2nd floor

Attendees will have fifteen minutes after the start time of the meeting to sign in. After that the attendance sheet will close. Failure to attend the mandatory Pre-Bid Conference will disqualify Bids received from any bidder not in attendance.

Questions pertaining to this bid must be communicated in writing and be received via email by May 19, 2015 at 3:00 P.M. (Tucson Time) Questions must be sent to the email address below and include the specified Bid Number, Project Name and Buyer’s name in the subject field of the email. Any questions should include a reference to the appropriate page and section number of the bid. E-Mail questions to: DO-Staff-FO-Procure@pima.edu . Answers will be posted as an addendum to our website by 5:00 P.M. (Tucson Time) on May 22, 2015.

Buyers Name/Title: Jan Posz, C.P.M., Sr. Buyer

Bids will be opened publicly at the Owner's office, 4905D East Broadway Blvd, Room D232, Tucson Arizona, at 3:00 P.M. (Tucson Time), May 27, 2015, and read aloud by a representative of the Owner. All information and Bids submitted by bidders will be made available for public inspection during regular business hours after an award is made, if any. Any bid received after the date and time listed above will be returned and not considered.

Copies of the NOTICE INVITING SEALED BIDS, Bid Documents and Forms as well as the College’s CONTRACT AND GENERAL CONDITIONS BETWEEN OWNER AND CONTRACTOR are available on the Pima Community College Website:

http://www.pima.edu/administrative-services/purchasing/current-requests-for-proposals-bids-quotes.html

The Owner intends to contract, if at all, with the lowest responsive and responsible bidder whose bid conforms in all material respects to the requirements of the bid documents, including the Plans and Specifications. "Responsive Bidder" means the bidder who submits a bid that conforms in all material respects to this Notice Inviting Sealed Bids, Instructions to Bidders and the Plans and Specifications which are incorporated herein by this reference. "Responsible Bidder" means the bidder who has the capability to perform the contract requirements and the integrity and reliability to assure complete and
good faith performance and who submits the lowest bid. In order for the bid to be considered, bidders must complete and submit the Bid form and all other required forms, which are incorporated herein by reference.

A certified or cashier’s check or Bid bond for ten percent (10%) of the Contract Amount proposed by the bidder must accompany each Bid as a guarantee that the bidder will enter into a contract to perform the work in accordance with the Plans and Specifications or as liquidated damages in the event of the bidder's failure or refusal to enter into a contract. The check or bond will be returned to the unsuccessful bidders. The successful bidder's check or bond will be returned upon the execution of satisfactory bonds and a contract as described by the bid documents.

It shall be mandatory on the contractor to whom the Contract is awarded, and upon any subcontractor under him, to comply in every respect with the applicable provisions of the Arizona Revised Statutes and with all other requirements of the laws of Arizona.

The bidder to whom the Contract is awarded shall furnish the Owner, within five (5) days after the award, satisfactory Payment and Performance Bonds in an amount equal to one hundred percent (100%) of the Contract Amount stated in the Bid. Individual surety bonds are not acceptable.

The Owner reserves the right to reject any or all Bids, to withhold the award of a contract for any reason it may determine and to hold any or all Bids for a period of forty-five (45) days. Any bid protests concerning this bid must be filed with the District Purchasing Director no later than the tenth calendar day following the date of award.

The Owner reserves the right to waive any irregularities in any Bid if such action is determined by the Owner, in its sole discretion, to be in the best interest of the Owner.

Thomas E. Harrington, C.P.M.
Director of Purchasing
Pima County Community College District
District Office – Purchasing
4905 East Broadway, Room 232
Tucson, Arizona 85709-1420
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SECTION ONE
INSTRUCTIONS TO BIDDERS

1. BIDS

To be entitled to consideration, Bids must be made in accordance with the following instructions:

a. Before submitting a Bid, each bidder shall examine the Notice Inviting Sealed Bids, these Instructions to Bidders, the Drawings, Specifications, Contract and General Conditions Between Owner and Contractor, and all other documents comprising the Contract Documents, and fully inform himself of all existing conditions and limitations, and include in the Bid a sum to cover the cost of all work required by the Contract Documents. The failure of any bidder to receive or examine any form, instrument, addendum, or other document, or visit the site and acquaint himself with conditions existing there, shall in no way relieve any bidder from obligations with respect to his Bid or the Contract Documents.

b. Bids shall be made only upon the form provided therefor. All blank spaces in the form shall be filled in completely. If some spaces do not apply, so state. Monetary amounts shall be stated both in writing and in numerals and, in case of any discrepancy between the two, the amounts in writing shall take precedence. The signature shall be in longhand and shall be that of an individual legally authorized to sign such form and bind the bidder. The completed form shall be without interlineation, alteration, or erasure.

c. Bids shall not contain any recapitulation of the work to be done. No oral, telegraphic, fax or telephonic bids or modifications shall be considered.

d. Bids shall be delivered to the place designated in the Notice Inviting Sealed Bids on or before the date and hour set for the opening of bids. Bids shall be enclosed in an opaque, sealed envelope, bearing the Bid Number, the title of the Project and the name of the bidder, except for that portion of the Bid bearing the title "List of Subcontractors and Material Vendors," which shall be enclosed in a separate, opaque, sealed envelope, as hereinafter specified in these Instructions to Bidders. It is the sole responsibility of the bidder to deliver his bid before the scheduled closing time. Any bids received after the scheduled closing time will be returned unopened.

e. The Contract Amount quoted is to include the furnishing of all materials, plant, equipment, tools, and all other facilities called for in the Contract Documents, and the performance of all labor and services necessary or proper for the completion of the Project, except such as may be otherwise expressly provided for in the Contract Documents.

f. The Bid form must be used without alteration.

2. LIST OF SUBCONTRACTORS AND MATERIAL VENDORS

a. For use of the Owner in determining competency and capability of those who will work on the Owner's Project, and quality and workmanship of those who will supply material to the Owner's Project, each bidder is required to submit with his bid a list naming the subcontractors who will be used
in performing the work. The list shall include any subcontractor that might be used in the event any or all of the various alternates are chosen by the Owner. The circumstances under which each subcontractor will be used must be specifically set forth by identifying alternates for which a particular subcontractor would be used.

b. **ONE**, and only one, subcontractor shall be submitted for each portion of the work for the Base Bid. The listing of more than one Subcontractor for any separate portion of the work shall be considered grounds for rejection of the bid by the Owner at the Owner's sole discretion.

c. The list shall be filled out and enclosed in a separate, opaque, sealed envelope bearing the title "List of Subcontractors," and the name of the bidder, and the envelope then inserted in the general bid envelope with the other forms. The list submitted by the successful bidder will be privately opened and will be retained by the Owner for record as a part of the Bid. The lists of other bidders will be returned unopened.

d. No subcontractor not named in such list and approved by the Owner may be employed on the Owner's Project without express written permission of the Owner, notwithstanding any other provision of the Contract Documents which may be interpreted to the contrary. Should a change in the approved list become necessary in the opinion of the successful bidder, a written request shall be submitted to the Owner stating the reason for the change, and written approval of the Owner must be obtained before such change is made. This provision shall apply to work listed to be performed by the bidder, as well as work listed to be performed by vendors or subcontractors.

e. By this requirement of a List of Subcontractors, the Owner does not establish any contractual relation between the Owner and any subcontractor, nor will the Owner inquire into contractual or other relations of the bidder with any subcontractor, nor does this list establish limits to the contracts between the bidder and any subcontractor. The sole purpose and function of such requirement is set forth in the first sentence of the first paragraph of this section.

f. If prior to the signing of the Contract the Owner has a reasonable objection to any person or organization on the List of Subcontractors, the Owner shall notify the apparent successful bidder in writing of such objection. Failure of the Owner to make an objection to any person or organization on the list prior to the award shall constitute acceptance of such person or organization except in the case where a subcontractor is later found not to be qualified by law.

g. If, prior to the signing of the Contract, regardless of whether the Owner has evidenced any intention to award the Contract to Contractor or not, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization except where such refusal is a result of the failure of a subcontractor to qualify by law, the apparent successful bidder may, prior to the signing, withdraw his bid without forfeiture of bid security. If the bidder submits an acceptable substitute the Owner may, at his discretion, accept or disqualify the bid.

3. **BASE BID AND ALTERNATES**
   
The Base Bid shall include all work as set forth on the Drawings, in the Specifications, and in all Contract Documents, plus the specified Contingency Reserve Fund and Cash Allowance, if any.
Alternate bid items are described in the Specifications and indicated on the Bid. The Owner shall have the right to accept Alternates in any order or combination and to determine the low bidder on the basis of the sum of the Base Bid and the Alternates accepted.

4. **BID SECURITY**

All Bids shall be accompanied by the bid security in the form and amount as published in the Notice Inviting Sealed Bids and as acceptable to the Owner, and shall be payable without conditions to the Owner as a guarantee that the bidder, if awarded the Contract, will promptly execute such Contract in accordance with the Bid and in the manner and form required by the Contract Documents, and will furnish good and sufficient bonds for the faithful performance of the work and payment of all claimants supplying labor or materials. The bid security must be enclosed in the same envelope with the Bid.

Note: The Notice Inviting Sealed Bids requires that this bid security will also serve as liquidated damages in the event the Contractor fails or refuses to enter into a contract. Mistake shall not excuse any failure or refusal to enter into a contract.

5. **WITHDRAWAL OF BID**

Any bidder may withdraw his Bid, either personally or by telegraphic or written request, at any time before the scheduled closing time for receipt of Bids. No bid may be withdrawn for at least forty-five (45) days after the date the bids are opened, nor may any bid be withdrawn between the scheduled closing time for receipt of Bids and the time the bids are actually opened.

6. **INTERPRETATIONS AND ADDENDA**

Following the Mandatory Pre-Bid Conference, all prospective bidders shall have an opportunity to submit questions or request clarifications to drawings or other Contract Documents in writing to the Owner regarding the Project. The due date for these questions or clarifications is specified on the NOTICE INVITING SEALED BIDS for the project. The Owner shall post a response or Addendum to the Bid documentation on the College website under the Bid Number. The bidder submitting a request for interpretations will be responsible for its prompt delivery. All requests for interpretations shall be made in writing. The Owner will not be responsible for any explanations or interpretations except those duly issued in the form of written addenda. Receipt of any addenda so issued during the time of bidding shall be included in the bid and shall be acknowledged in the Bid and be made a part of the Contract Documents.

7. **APPROVAL OF EQUAL ITEMS OF EQUIPMENT AND/OR MATERIALS BEFORE SUBMISSION OF BIDS**

Products are generally specified by reference standard and/or manufacturer's name and model number or trade name. When specified only by reference standard, the bidder may select any product meeting this standard by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the bidder has the option of using any product and manufacturer combination listed.
When a specific manufacturer, installer (where pre-qualification is required), trade name or material is specified, or indicated, it is to establish a standard of quality and shall not be construed as limiting competition. If the bidder desires to use other than that specified, he shall request approval of such substitution in the manner specified below:

a. **Prior Approvals:** Substitutions will be considered only when a written request has been submitted by a bidder, who shall be a general contractor qualified to submit a bid to the Owner, for approval at least fourteen (14) calendar days prior to the original date for receipt of bids. No approvals will be granted to suppliers, distributors or subcontractors. Each request shall include all information requested hereinafter. If the Owner approves any proposed substitution, such approval shall be set forth in an Addendum.

b. **Submittal Requirements:** All requests shall contain sufficient information, descriptive brochures, drawings, performance and test data, samples or other data as is necessary for complete evaluation and shall indicate by direct comparison how the proposed substitution compares with the specified equipment or material in every material respect with that specified. Each submittal shall be well marked and identified as to the type and kind of items proposed to be substituted. It is the sole responsibility of the bidder to submit complete descriptive and technical information so that the Owner can make a complete evaluation. Lack of sufficient information will be cause for rejection. References to catalogs will not be acceptable. Submittals shall be accompanied by a written statement from the manufacturer or contractor on his letterhead certifying that the proposed substitution meets or exceeds that specified in all aspects and that it will coordinate properly with related construction. Any redesign necessitated by the substitution shall be paid for by the Contractor.

c. **As set forth in the Specifications,** the bidder’s request for prior approval shall include, without limitation:

1. Complete data substantiating compliance of the proposed substitution with the Contract Documents.

2. Product identification, including manufacturer's name, address and telephone number.

3. A tabulation comparing the specified product manufacturer’s complete product description, performance test data and reference standards with the same information for the proposed products.

4. Samples and colors of the proposed products.

5. Names and addresses of similar projects in which the proposed product was used and the date of installation.

6. For construction methods, include a detailed description for proposed method and drawings illustrating same.

7. Accurate cost data on proposed substitution in comparison with product or method specified.
d. Any bidders, other than the bidder who requested a particular substitution, who choose to utilize a prior approved item, as approved by Addendum, shall comply with all terms and conditions of the original prior approval submittal. All provisions of this Paragraph 8 regarding using of substitutions shall apply to any bidder who chooses to utilize such substitution.

8. BIDDERS INTERESTED IN MORE THAN ONE BID

No person, firm, or corporation shall be allowed to make, file, or be interested in more than one bid for the same work. A person, firm, or corporation who has submitted a sub-bid to a bidder, or who has quoted prices on materials to a bidder, is not thereby disqualified from submitting a sub-bid or quoting prices to other bidders.

9. ACCEPTANCE OR REJECTION OF BIDS

The Owner reserves the right to reject any or all bids and to waive any informalities in the Bids received. The award of the Contract, if made by the Owner, will be made to the responsible and qualified bidder submitting the lowest bid, but the Owner shall determine in its own discretion whether a bidder is responsible and qualified to perform the Contract, what bid is the lowest, and whether it is in the interest of the Owner to accept the bid.

10. AGREEMENT AND BONDS

The form of agreement which the successful bidder will be required to execute, and the forms and amounts of surety bonds required at the time of execution of the agreement, are included in the Contract Documents and must be carefully examined by the bidder. As noted in the instructions, all bids must include any exceptions requested from the Contract Documents; subsequent requests for deviation from the Contract Document will not be considered. All sureties must be authorized to do business in Arizona, listed on the U.S. Department of Treasury's list of approved sureties, and must be satisfactory to the Owner. No individual sureties are acceptable. The successful bidder must furnish the required bonds and insurance certificates and commence work within five (5) days after issuance of the Notice of Intent to Award and Notice to Proceed. By submission of a Bid, a bidder will be deemed, and agrees to be so treated, to have actual notice of every term of every Contract Document.

11. NON-COLLUSION AFFIDAVIT

The successful bidder, before the award of the Contract, shall submit to the Owner non-collusion affidavits covering the bidder and all subcontractors.

12. LIST OF COMPARABLE PROJECTS

If requested by Owner, the bidder must submit, within 24 hours after bid opening, a list of all projects undertaken within the three (3) years immediately preceding the bid date and a Contractor's Qualification Statement in the form of AIA A-305. Such list shall include the name, address and phone number of the owner and the architect of each project, the contract amount, and the starting date. Bidder consents to the use of the list and Qualification Statement by Owner to inquire into bidder's fitness, capabilities and responsibility in connection with Owner's consideration of the bid. Bidder agrees to hold
harmless the Owner, the Architect, and each owner and architect listed from any action or claim that might arise from any adverse report received by Owner concerning bidder's performance on the projects listed. Failure to furnish a complete list and Qualification Statement as required herein may be considered grounds for rejection of the bid by the Owner, at the Owner's sole discretion.

13. **BID PROTESTS**

Any bid protests concerning this bid must be filed with the District Purchasing Director no later than the tenth calendar day following the date of award at: 4905D East Broadway Blvd, Tucson, Arizona 85708-1420.
SECTION TWO
CONTRACT AND GENERAL CONDITIONS
BETWEEN OWNER AND CONTRACTOR

West Campus Men’s Gym Locker Area Remodel

THIS AGREEMENT, made this ______ day of ____________, 201__, by and between West Campus Men’s Gym Locker Area Remodel, hereinafter called the "Contractor," and Pima County Community College District, operating in Pima County, hereinafter called the "Owner":

W I T N E S S E T H:

That the Contractor and the Owner agree as follows:

ARTICLE 1
THE CONTRACT DOCUMENTS

1. CONTRACT DOCUMENTS.

1.1 The following listed documents constitute the Contract Documents, and they are all as fully a part of the Contract and General Conditions as if herein repeated:

1. This Contract and General Conditions between Owner and Contractor.
2. Notice of Award and Receipt of Notice
3. Notice to Proceed and Receipt of Notice
4. Performance Bond and Payment Bond.
5. Addenda Nos. __________________ dated ________________.
6. Specifications and Drawings (as modified by the above-referenced Addenda and selected alternates as listed herein, if any) as set forth in the bid document, incorporated herein by reference.
7. Bid Form, dated ____________________.
8. Instructions to Bidders.
10. Certificates of Insurance.

1.1.2 In the event of any inconsistency between any of the terms of the before enumerated documents, such inconsistencies shall be resolved by giving precedence to the terms of the lowest numbered of the above numbered documents. Anything in these Contract Documents to the contrary notwithstanding, the provisions of all pertinent general public laws of the State of Arizona in effect at
the time of the execution of this Contract shall be a part of the Contract between the parties and shall take precedence over all of the other Contract Documents.

ARTICLE 2
SCOPE OF WORK

2.1 As required by the Contract Documents, the Contractor shall furnish and install all of the materials and labor and perform all of the work for the Owner's Project known as West Campus Men's Gym Locker Area Remodel ("Project" herein).

ARTICLE 3
CONTRACT AMOUNT, TIME, LIQUIDATED DAMAGES AND EARLY COMPLETION BONUS

3.1 CONTRACT AMOUNT. The Owner shall pay the Contractor the sum of ___________________ Dollars ($_________________) for the Base Bid and alternates ___________, which is the Contract Amount. This sum is subject to additions or deductions made in accordance with the provisions of the Contract Documents.

3.2 CONTRACT TIME. The Contract Time as used and defined in Article 11 herein shall be Fifty Five (55) calendar days.

3.3 LIQUIDATED DAMAGES AND EARLY COMPLETION BONUS.

3.3.1 Liquidated damages as used and defined in Article 11 herein shall be Five Hundred Dollars ($500.00) per calendar day for each day the Work remains not substantially complete after expiration of the Contract Time as defined in Article 11 and specified in Subparagraph 3.2 above.

3.3.2 An Early Completion Bonus shall be paid to the Contractor at the rate of Five Hundred Dollars ($500.00) per calendar day the work is Substantially Complete in advance of the expiration of the Contract time up to a maximum of Ten Thousand Dollars ($10,000.00). For purposes of the Early Completion Bonus, the Contract Time(s) shall not be extended or changed for any reason.

3.4 CHANGE ORDERS. Limits on the amount of overhead and profit allowed on Change Orders are specified in Article 15. An item of additional work or change in Plans and Specifications which involves an extra cost shall be valid only if authorized by Change Order in accordance with Article 15 of this Contract and General Conditions.

ARTICLE 4
DEFINITIONS AND GENERAL PROVISIONS

4.1 OWNER, OWNER’S REPRESENTATIVE AND CONTRACTOR. The Owner, Owner’s Representative and the Contractor are those herein defined in this Contract and General Conditions. They are treated throughout the Contract Documents as though each were of the singular number and masculine gender.
4.2 SUBCONTRACTOR. See Article 8.

4.3 NOTICE. See Articles 7 and 10.

4.4 TIME. See Articles 3 and 11.

4.5 COST. The term "Cost" shall include all charges, costs, losses and expenditures of every kind whatsoever for the Work, or portion thereof to which reference is made with respect to this term.

4.6 FINISH, SUBSTANTIAL COMPLETION AND FINAL COMPLETION DATES. See Article 11.

4.7 MODIFICATIONS. See also Article 1. A Modification is:

.1 A written amendment to the Contract and General Conditions signed by all parties;

.2 A Change Order properly signed by all parties pursuant to Paragraph 15.1; or

.3 A Field Order for a minor change in the Work issued by the Owner pursuant to Paragraph 15.4.

A Modification may be made only after execution of the Contract and General Conditions.

4.8 CONTRACT. The Contract consists of all the Contract Documents enumerated in Article 1. The Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Paragraph 4.7.

4.9 WORK. The term "Work" includes, without limitation, furnishing all labor, administrative services and supervision necessary to produce the construction required by the Contract Documents and furnishing and installing all materials and equipment incorporated, or to be incorporated, in such construction to complete the Project.

4.10 PROJECT. The Project is the total construction designed by the Owner of which the Work performed under the Contract Documents may be the whole or a part.

4.11 EXECUTION, CORRELATION, INTENT AND INTERPRETATIONS OF THE CONTRACT DOCUMENTS.

4.11.1 The Contract and General Conditions shall be signed by the Owner and the Contractor. By executing the Contract and General Conditions, each party accepts and agrees to be bound by each of the Contract Documents listed in Article 1.
4.11.2  By executing the Contract and General Conditions, the Contractor represents and warrants that he has visited the site, has familiarized himself with the local conditions under which the Work is to be performed, including any and all relevant weather conditions or records or both, and correlated all of his observations with the requirements of the Contract Documents.

4.11.3  The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. The intention of the Contract Documents is to include, without limitation, all labor, materials, equipment and other items as provided in Subparagraph 7.4.1 necessary for the proper execution and completion of the Work. Words and abbreviations which have well known technical or trade meanings are used herein in accordance with such recognized meanings.

4.11.4  The organization of the Specifications into divisions, sections and articles, and the arrangements of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade, or constituting part of the Contract or having any legal or contractual significance.

4.11.5  Written interpretations necessary for the proper execution or progress of the Work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Owner in accordance with any schedule agreed upon, or with reasonable promptness in any case. Such interpretations shall be consistent with and reasonably inferable from the Contract Documents.

4.12  COPIES FURNISHED AND OWNERSHIP.

4.12.1  The Contractor will be furnished, free of charge, all copies of Contract Documents reasonably necessary for the execution of the Work as determined by the Owner in his sole discretion.

4.12.2  All Drawings, Specifications and other data, and copies thereof, furnished to the Contractor are and shall remain the property of the Owner. They are not to be used on any other project, and, with the exception of one set for each party to the Contract, are to be returned to the Owner upon request at the completion of the Work.

4.12.3  It shall be the responsibility of the Contractor to ensure that each Subcontractor, Sub-subcontractor and supplier has a current set of those portions of the Construction Documents that may be required for proper execution of their respective portions of the Work.

ARTICLE 5
OWNER’S REPRESENTATIVE

Drawings and Specifications for this Project were prepared by BWS Architects (Owner’s Representative, hereinafter referred to as ‘OR’), who shall act as OR pursuant to the Contract Documents.

5.1  OR: DEFINITION

5.1.1  The OR is the person or organization identified as such in this Contract and General Conditions, and the term OR means the OR or his authorized representative.
5.1.2 Nothing contained in the Contract Documents shall create any contractual relationship between the OR and the Contractor.

5.2 ADMINISTRATION OF THE CONTRACT.

5.2.1 The OR will be the Owner's representative during construction, until final payment and including the warranty period. The OR will have authority to act on behalf of the Owner, unless otherwise modified by written instrument which will be shown to the Contractor. The OR will advise and consult with the Owner, and all of the Owner's instructions to the Contractor shall be issued through the OR, except where the Owner deems direct communication with the Contractor necessary. Any direct communication between Owner and Contractor shall be copied to the OR. The OR and any person designated by Owner as Special Agent shall be Special Agents acting for and on behalf of the Owner for the duration of this Contract.

5.2.2 The OR shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the OR may perform their functions under the Contract Documents.

5.2.3 Neither the OR's authority to act under this Contract, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty of responsibility of the OR to the Contractor, any Subcontractor or material supplier, any of their agents or employees, or any other performing any of the Work.

5.2.4 The duties, responsibilities and limitations of authority of the OR as the Owner's representative during construction as set forth in Articles 1 through 18, inclusive, of this Contract and General Conditions will not be modified or extended without written consent of the Owner and the OR, notice of which will be given to the Contractor.

5.2.5 The OR will not be responsible for the acts or omissions of the Contractor, any Subcontractors or Material Vendors, or any of their agents or employees, or any other persons performing any of the Work.

5.2.6 In case of the termination of the employment of the OR, the Owner shall appoint a successor, whose status under the Contract Documents shall be that of the former OR.

ARTICLE 6
OWNER – CONTRACT ADMINISTRATION

6.1 DEFINITION. The Owner is the person or organization identified as such in the Contract and General Conditions.

6.2 ADMINISTRATION OF THE CONTRACT.

6.2.1 The OR will provide general administration of this Contract, including performance of the functions hereinafter described.
6.2.2  The Owner and the OR shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Owner and the OR may perform their functions under the Contract Documents.

6.2.3  The OR shall make periodic visits to the site to observe the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. These visits shall be of the frequency necessary to adequately observe the progress of the Work. On the basis of his on-site observations, he shall endeavor to guard against defects and deficiencies in the Work of the Contractor. The Owner shall not be responsible for the Contractor's ways and means, methods, techniques and procedures in the construction of the Project or for enforcement of safety requirements on the Project.

6.2.4  Based on such observations and the Contractor's Applications for Payment, the OR will make recommendations as to the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Subparagraph 12.4.1.

6.2.5  The OR will be, in the first instance, the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder by the Contractor, except where otherwise provided herein. The OR will promptly render such interpretations as he may deem necessary for the proper execution or progress of the Work.

6.2.6  All claims, disputes and other matters in question relating to the execution or progress of the Work, payment, time extension or interpretation of the Contract Documents shall be submitted to the Owner in the manner provided by Subparagraph 12.4.4, within the time limits prescribed in Subparagraph 15.2.1, for decision by the Owner, as the subject of the matter may require, which will be rendered in writing within a reasonable time.

6.2.7  The Owner's decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.

6.2.8  If a decision of the Owner states that it is final but subject to appeal, no claim, dispute or other matter covered by such decision may be made later than thirty (30) days after the date on which the party making the demand received the decision.

6.2.9  The OR shall have authority to reject Work which does not conform to the Contract Documents. Whenever, in the OR's reasonable opinion, he considers it necessary or advisable to ensure the proper implementation of the intent of the Contract Documents, he will require the Contractor to stop the Work or any portion thereof, or to require special inspection or testing of the Work as provided in Subparagraph 10.8.2, whether or not such Work be then fabricated, installed or completed.

6.2.10  The OR will review Shop Drawings, Product Data and Samples promptly as provided in Subparagraphs 7.12.1 through 7.12.8, inclusive.

6.2.11  The OR will prepare Change Orders in accordance with Article 15 and will have authority to order minor changes in the Work not involving extra cost as provided in Subparagraph 15.3.
6.2.12 The OR will conduct inspections to determine the date or dates of Substantial Completion and Final Completion and shall issue a Certificate of Substantial Completion and of Final Completion. He will receive written guarantees, record drawings, maintenance manuals and related documents required by the Contract and assembled by the Contractor.

6.2.13 The Owner will not be responsible for the acts or omissions of the Contractor, any Subcontractors or Material Vendors, or any of their agents or employees, or any other persons performing any of the Work.

6.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER.

6.3.1 The Owner shall furnish all surveys describing the physical characteristics, legal limits and utility locations for the site of the Project.

6.3.2 Information or services under the Owner's control shall be furnished by the Owner with promptness to avoid delay in the orderly progress of the Work.

6.3.3 All final decisions concerning Change Orders, Payments, Substantial Completion, Final Completion, Liquidated Damages and Contract Time shall be reserved to the Owner, and this provision of the Contract shall take precedence over any other term hereof.

6.3.4 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by separate contractors, payments, completion and insurance in Articles 9, 12 and 14, respectively.

ARTICLE 7
CONTRACTOR

7.1 DEFINITION.

7.1.1 The Contractor is the person or organization identified as such in this Contract and General Conditions and the term "Contractor" means the Contractor or his authorized representative. The Contractor, and all Subcontractors employed on the Project, shall possess valid Arizona Contractor's Licenses as required by law.

7.1.2 Whenever the words "as may be directed," "suitable," "or equal," "as approved," or other words of similar intent and meaning are used within the Contract Documents implying that judgment or discretion is to be exercised or a decision is to be made, it is understood that it is the judgment, discretion or decision of the OR to which reference is made.

7.1.3 All materials and articles of any kind necessary for this Work are subject to the approval of the Owner as provided in the Contract Documents.
7.1.4 After execution of the Contract, changes of brand named, trade named, trademarked, patented articles, or any other substitutions will be allowed only by written order signed by the Owner, in which case the Owner shall receive all benefit of the difference in cost involved, except where choice of material or method is designated "or equal" or "acceptable alternates" in the Specifications.

7.2 REVIEW OF CONTRACT DOCUMENTS AND EXAMINATION OF SITE.

7.2.1 By executing this Contract, the Contractor warrants that he has examined the site and carefully studied and compared the Contract and General Conditions, Drawings, Specifications, Addenda, and all other Contract Documents before so executing the Contract. The Contractor shall at once report to the Owner any error, inconsistency or omission he may discover. The Contractor shall not be liable to the Owner for any damage resulting from any such errors, inconsistencies or omissions so long as the Owner is notified thereof, unless discovery of such error, inconsistency or omission should have been made by careful examination of the Contract Documents prior to submitting a Bid. The Contractor shall do no Work without appropriate Contract Documents, or where required, approved Shop Drawings, Product Data, Samples or interpretations from the Owner.

7.2.2 The Contractor shall be required to use for data and dimensions, figures marked on the drawings in preference to what the drawings may measure to scale. In the absence of figured dimensions, the Owner shall be notified and the dimensions provided within a reasonable time. Drawings shall not be scaled in the absence of figured dimensions.

7.2.3 The Contractor shall verify all dimensions shown and check all measurements in connection with any present building or buildings, levels of grades, walks, driveways, or other existing conditions, before executing any work. Contractor shall immediately report to the Owner any discrepancies between the Plans and actual field conditions. Failure to report any discrepancy within 24 hours after discovery will constitute a waiver of any claim arising out of such discrepancy. This provision shall have precedence over any other notice provisions contained herein.

7.3 SUPERVISION AND CONSTRUCTION PROCEDURES. The Contractor shall supervise the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

7.4 LABOR AND MATERIALS.

7.4.1 Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, heat, utilities, transportation and any other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. No materials shall be incorporated into this Work that contains any asbestos.

7.4.2 Any work necessary to be performed after regular working hours, on Sundays or legal holidays, shall be performed without additional expense to the Owner unless approved in advance by Change Order.
7.4.3 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. When requested by the Owner, the Contractor shall remove from the Project any person who commits trespass or is, in the opinion of the Owner, disorderly, dangerous, insubordinate, incompetent or violates any policies of the Owner. The owner will document the request within 1 work day if requested by the Contractor. The Contractor shall keep the Owner harmless from damages or claims for compensation that may occur in the enforcement of this requirement. The Contractor shall not permit the use of tobacco products (except in designated areas), alcohol or illegal drugs on the project site.

7.5 WARRANTY.

7.5.1 The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not so conforming to these standards may be considered defective. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

7.5.2 The warranty provided in Paragraphs 7.5 and 18.1 shall be in addition to and not in limitation of any other warranty or remedy available pursuant to law or the Contract Documents.

7.6 TAXES. The Contractor shall pay all sales, consumer, use, transaction privilege and other taxes required by law in connection with the performance of this Contract, whether in force as of the date of this Contract or later imposed. If the Contractor's principal place of business is not in Arizona, Contractor shall post a bond for taxes in compliance with A.R.S. § 42-5007 and furnish evidence of such bond to Owner prior to submitting any application for payment hereunder

7.7 PERMITS, FEES AND NOTICES.

7.7.1 Unless otherwise provided in the Plans, Specifications or by Addendum, the Contractor shall secure and pay for all permits, fees, inspections and re-inspections necessary for the proper execution and completion of the Work, including, without limitation, the following permits and fees: building, plumbing, mechanical, electrical permits, water meters, water service fees, sewer connection fees, sewer fees or assessments, gas service fees and electric service fees payable to the utility companies. The Contractor shall procure and pay for all necessary utilities for the Project, including temporary utility hook-ups and utilities used in course of construction.

7.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the Work. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Owner in writing. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility therefor and shall bear all costs attributable thereto, including any attorneys’ fees incurred by Owner in connection therewith.

7.8 SUPERINTENDENT. The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The
Contractor shall assign to the Project a Superintendent prior to the pre-construction meeting and shall furnish to the Owner the Superintendent's resume. The Superintendent shall be satisfactory to the Owner and shall not be changed except with the consent of the Owner, unless the Superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent shall represent the Contractor, and all communications given to the Superintendent shall be as binding as if given to the Contractor. Important communications will be confirmed in writing. Other communications will be so confirmed on written request in each case.

7.9 RESPONSIBILITY FOR THOSE PERFORMING THE WORK. The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all Subcontractors, their agents and employees, and all other persons performing any of the Work or supplying any material or equipment to be incorporated in the Work under a contract of any nature with the Contractor.

7.10 PROGRESS SCHEDULE AND REPORTS.

7.10.1 The Contractor, within fourteen (14) days after being awarded the Contract, shall prepare and submit for the Owner's review his planned Construction Progress Schedule for the Work as provided in the Specifications. The Construction Progress Schedule shall be related to the entire Project and shall indicate the dates for the starting and completion of the various components and phases of construction and shall be revised monthly or as required by the conditions of the Work, upon request of and subject to the review of the Owner. The Contractor shall comply with the requirements of the Specifications in connection with the preparation and revision of the Construction Progress Schedule. The Contractor agrees to promptly respond to all inquiries by the Owner concerning significant deviation of the progress of construction from the Construction Progress Schedule. Failure to timely respond to such request or significant delay from the Construction Progress Schedule may result in progress payments being withheld. Approval of the Construction Progress Schedule by the Owner shall not relieve the Contractor from his obligation to complete the Project within the Contract Time.

The Contractor shall furnish to the Owner four (4) copies of a complete list of all major items of architectural, mechanical, plumbing and electrical equipment and materials within fourteen (14) days of the Start Date. Include projected dates of submittal of all items of material for which submittals are required and delivery dates of all items of material and equipment that are considered by the Owner, in his sole discretion, critical or which may require, in order to obtain, long lead time. Submit a complete list. A partial list will not be acceptable unless prior permission is obtained from the Owner. The Contractor shall prepare and provide to the Owner a weekly Construction Schedule Status Report which will inform the Owner that, with respect to each category of the Construction Progress Schedule and each item on the material delivery date list, the work or delivery is: (a) on schedule; (b) behind schedule, but will not interfere with the completion of the Project within the Contract Time specified in the Contract; or (c) behind schedule and may prevent the completion of the Project within the Contract Time. In the event that the Construction Schedule Status Report indicates that a delay has occurred or may occur that may prevent the completion of the Project within the Contract Time because the Work in a particular category is behind schedule or a delay in material deliveries is anticipated, the Construction Schedule Status Report shall contain a statement of what corrective measures are being undertaken by the Contractor.
7.10.2 For purposes of determining time extensions resulting from additional work ordered by the Owner, adverse weather or other delays, all float or slack time in the Construction Progress Schedule shall be owned and controlled by the Owner. The Owner shall allow use of such float or slack time by the Contractor as long as such allocation of float or slack time does not adversely affect the completion date of the Project. No additional time shall be allowed for claims for delay, whether or not caused by or the fault of the Owner, if such delay is less than the available float or slack time available for the particular task.

7.11 DRAWINGS AND SPECIFICATIONS AT THE SITE.

7.11.1 The Contractor shall maintain at the site for the Owner one (1) copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, other Modifications, and manufacturers' printed specifications and recommendations, in good order and marked carefully, legibly and accurately to record on a daily basis all changes made during construction, all of which shall be available to the Owner at all times. These Drawings shall be delivered to the OR upon completion of the Work. The Drawings indicating the changes shall be maintained throughout the duration of the Project and are the Record Drawings which shall be transferred to electronic media by the Owner.

7.11.2 The Contractor shall also submit to the Owner for his record three (3) copies each (unless otherwise specified) of all manufacturers' maintenance manuals, printed specifications and recommendations, which by reference in the several divisions of the Specifications are a part thereof.

7.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

7.12.1 Shop Drawings and Product Data are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are required by the Contract Documents and are prepared by the Contractor or any Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor, and which illustrate or describe some portion of the Work.

7.12.2 Samples are physical examples furnished by the Contractor to illustrate materials, equipment or workmanship, and to establish standards by which the Work will be judged.

7.12.3 The Contractor shall review, correct any errors, stamp with his approval and submit, with promptness and in orderly sequence so as to cause no delay in the Work or in the work of any other contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents or subsequently by the OR as covered by Modifications. Shop Drawings, Product Data and Samples shall be properly identified as specified, or as the OR may require. At the time of submission, the Contractor shall inform the Owner in writing of any deviation in the Shop Drawings, Product Data or Samples from the requirements of the Contract Documents. The OR's responsibility for reviewing Shop Drawings, Product Data, Samples and other submissions of the Contractor are limited to those required by the Contract Documents or Modifications to the Contract Documents.

7.12.4 By approving and submitting Shop Drawings, Product Data and Samples, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, and that he has checked and coordinated all Shop Drawings, Product Data and Samples with the requirements of the Work and of the Contract Documents.
7.12.5 The OR will review and take other appropriate action with respect to Shop Drawings, Product Data and Samples with reasonable promptness so as to cause no delay, but only for conformance with the Contract Documents.

7.12.6 The Contractor shall make any corrections required by the OR to comply with the Contract Documents and shall resubmit the required number of corrected copies of Shop Drawings, Product Data or new Samples until approved. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings and Product Data to revisions other than the corrections requested by the Owner on previous submissions.

7.12.7 The OR's review of Shop Drawings, Product Data or Samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Owner in writing of such deviation at the time of submission and the OR has given written approval to the specific deviation, nor shall the Owner's approval relieve the Contractor from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples.

7.12.8 No portion of the Work requiring a Shop Drawing, Product Data or Sample submission shall be commenced until the submission has been approved by the Owner. All such portions of the Work shall be in accordance with approved Shop Drawings, Product Data and Samples.

7.13 CUTTING AND PATCHING OF WORK. Any cutting and patching required shall be performed in accordance with instructions contained in the technical specifications of this project.

7.14 CLEANING UP.

7.14.1 The Contractor at all times during the progress of the Work shall keep the buildings and site free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work, he shall remove all his waste materials and rubbish from and about the Project, as well as all his tools, construction equipment, machinery and surplus materials not specified to be left at the site, and shall clean all glass surfaces and other areas or materials as specified, and leave the Work "broom-clean" or its equivalent, except where more stringent cleaning requirements are provided by the Contract Documents.

7.14.2 If the Contractor fails to satisfactorily clean up, the Owner will do so and the cost thereof shall be charged to the Contractor as provided in Paragraph 10.6.

7.15 COMMUNICATIONS. The Contractor shall forward all written communications to the OR except where otherwise required herein.

7.16 INDEMNIFICATION. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the District, its agents, representatives, officers, directors, officials and employees from and against all claims, damages, losses and expenses (including but not limited to attorney fees, court costs, and the cost of appellate proceedings), relating to, arising out of, or alleged to have resulted from the acts, errors, mistakes, omissions, work or services of the Contractor, its employees, agents, or any tier of subcontractors in the performance of this Contract. Contractor’s duty
to defend, hold harmless and indemnify the District, its agents, representatives, officers, directors, officials and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, or injury to, impairment, or destruction of property including loss of use resulting therefrom, caused by any acts, errors, mistakes, omissions, work or services in the performance of this Contract including any employee of the Contractor or any tier of subcontractor or any other person for whose acts, errors, mistakes, omissions, work or services the Contractor be legally liable.

The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

ARTICLE 8
SUBCONTRACTORS

8.1 DEFINITION.

8.1.1 A Subcontractor is a person or organization who has a direct contract with the Contractor to supply materials or equipment or to perform any of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative.

8.1.2 A Sub-subcontractor is a person or organization who has a direct or indirect contract with the Subcontractor to perform any of the Work at the site, or to supply any materials or equipment to be used in the Project. The term "Sub-subcontractor" is referred to throughout the Contract Documents as singular in number and masculine in gender, and means a Sub-subcontractor or an authorized representative thereof.

8.1.3 Nothing contained in the Contract Documents shall create any contractual, master-servant or principal-agent relationship between the Owner, and any Subcontractor or Sub-subcontractor.

8.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK.

8.2.1 If, after the actual signing of this Agreement, the Owner refuses to accept any person or organization on the Subcontractor and Material Vendor List for good and substantial reason, the Contractor shall submit an acceptable substitute and the Contract Amount shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the Contract Amount shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto.

8.2.2 The Contractor shall not contract with any Subcontractor proposed to perform portions of the Work designated in the Construction Documents, or if none is so designated, with any Subcontractor proposed for the principal portions of the Work who has not been accepted by the Owner. The Contractor will not be required to contract with any Subcontractor against whom he has a reasonable objection.
8.2.3 If the Owner requires a change of any proposed Subcontractor previously accepted by it, the Contract Amount shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued.

8.2.4 The Contractor shall not make any substitution for any Subcontractor who has been accepted by the Owner unless the substitution is approved in writing by the Owner.

8.2.5 Notwithstanding any provisions to the contrary in the Contract Documents, if any Subcontractor listed is found not to be qualified to perform public work as a matter of law, upon written notice from the Owner, the Contractor shall submit a qualified Subcontractor for the Owner's approval and shall substitute such qualified and approved Subcontractor at no additional cost to the Owner.

8.3 SUBCONTRACTUAL RELATIONS.

8.3.1 All work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate written agreement between the Contractor and the Subcontractor (and where appropriate between Subcontractors and Sub-subcontractors) which shall contain provisions that:

.1 preserve and protect the rights of the Owner under the Contract with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights;

.2 require that such work be performed in accordance with the requirements of the Contract Documents;

.3 require submission to the Contractor of applications for payment under each subcontract to which the Contractor is a party, in reasonable time to enable the Contractor to apply for payment in accordance with Article 12;

.4 require that all claims for additional costs, extensions of time, damages for delays or otherwise with respect to subcontracted portions of the Work shall be submitted to the Contractor (via any Subcontractor or Sub-Subcontractor where appropriate) in the manner provided in the Contract Documents for like claims by the Contractor upon the Owner;

.5 waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by the property insurance described in Article 14, except such rights as they may have to the proceeds of such insurance held by the Owner as trustee under Article 14; and

.6 obligate such Subcontractor specifically to consent to the provisions of this Paragraph 8.3.
8.4 PAYMENTS TO SUBCONTRACTORS.

8.4.1 The Owner may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding percentages of completion certified to the Contractor on account of work done by such Subcontractors.

8.4.2 The Owner shall not have any obligation to pay or to see to the payment of any monies to any Subcontractor except as may otherwise be required by law.

ARTICLE 9
SEPARATE CONTRACTS

9.1 OWNER'S RIGHT TO AWARD SEPARATE CONTRACTS. The Owner reserves the right to award other contracts in connection with other portions of the Project under conditions similar to this Contract.

9.2 MUTUAL RESPONSIBILITY OF CONTRACTORS.

9.2.1 The Contractor shall afford other contractors reasonable opportunity for the introduction to the site and storage of their materials and equipment thereon and the execution of their work, and shall properly connect and coordinate his Work with theirs.

9.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of any other separate contractor, the Contractor shall inspect and promptly report to the Owner any apparent discrepancies or defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper to receive his Work, except as to defects which may develop in the other separate contractor's work after the execution of the Contractor's Work.

9.2.3 Should the Contractor cause damage to the work or property of any separate contractor on the Project, the Contractor shall, upon written notice, promptly attempt to settle such other contractor's claim. If such separate contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall promptly notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment against the Owner arises therefrom, the Contractor shall promptly pay or satisfy it and shall immediately, upon presentation to it of a statement thereof, reimburse the Owner for all attorneys’ fees and court costs which the Owner has incurred.

9.3 CUTTING AND PATCHING UNDER SEPARATE CONTRACTS.

9.3.1 The Contractor shall do all cutting, fitting or patching of his Work that may be required to fit it to receive or be received by the work of other contractors indicated in the Contract Documents. The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other contractor except with the written consent of the Owner.
9.3.2 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefor.

9.4 OWNER'S RIGHT TO CLEAN UP. If a dispute arises between the separate contractors as to their responsibility for cleaning up as required by Paragraph 7.14, the Owner may clean up and charge the cost thereof to the several contractors as the Owner shall determine to be just.

ARTICLE 10
MISCELLANEOUS PROVISIONS

10.1 LAW OF THE PLACE. The Contract shall be governed by the law of the State of Arizona, and any other subordinate jurisdiction in which the Project is located.

10.2 SUCCESSORS AND ASSIGNS. The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or any part hereof or sublet it as a whole or in part without the written consent of the other, nor shall the Contractor assign or pledge any monies due or to become due to him hereunder without the previous written consent of the Owner.

10.3 WRITTEN NOTICE. Written notice shall be deemed to have been duly served if delivered in person to the individual for whom it was intended or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice.

10.4 CLAIMS FOR DAMAGES. Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party or of any of his employees, agents or others for whose acts he is legally liable, which claim is not covered by Article 15 hereof, a claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

10.5 PERFORMANCE BOND AND PAYMENT BOND. The Contractor shall furnish and maintain performance and payment bonds as required by Arizona law covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner may prescribe and with such sureties as may be agreeable to the Owner. The premiums shall be paid by the Contractor. The Contractor shall, prior to commencement of the Work, submit such bonds to the Owner. Individual sureties are not acceptable.

10.6 OWNER'S RIGHT TO COMPLETE THE WORK. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform any provision of the Contract, the Owner may, after seven (7) days written notice to the Contractor and/or his surety, if any, and without prejudice to any other remedy he may have, proceed to make such other necessary and reasonable arrangements to carry out the Work in accordance with the Contract Documents, all at the expense of the Contractor, including the Owner's attorneys' fees and other costs.
10.7 ROYALTIES AND PATENTS. The Contractor shall pay all royalties and license fees. He shall defend all suits or claims from infringement of any patent right and shall save the Owner harmless from loss on account thereof, including Owner's attorneys' fees and court costs, except that Owner shall be responsible for all such loss when a particular design, process or product of a particular manufacturer or manufacturers is specified. But, if the Contractor has reason to believe that the design, process or products specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives information to the Owner prior to starting the Work.

10.8 TESTS.

10.8.1 Where the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any of the Work to be inspected, tested or approved, the Contractor shall give the OR timely notice of its readiness and of the date arranged so the OR may observe such inspection, testing or approval. The Owner shall pay the cost of all such tests, except where otherwise provided herein, and except for retest or re-inspection of Work which fails to comply with the Contract Documents.

10.8.2 All equipment and materials used in the construction of the Project, especially those upon which the strength and durability of the structure may depend, shall be subject to adequate inspection and testing in accordance with accepted standards to establish conformity with Specifications, applicable codes and standards and suitability for use intended, all as set forth more particularly in the Specifications.

10.8.3 If after the commencement of the Work the OR determines that any of the Work requires special inspection, testing or approval which Subparagraph 10.8.1 does not include, he will, upon written authorization from the OR, order such special inspection, testing or approval, and the Contractor shall give notice of readiness as in Subparagraph 10.8.1. If such special inspection or testing reveals a failure of the Work to comply:

.1 with the requirements of the Contract Documents, or

.2 with laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over the Work,

the Contractor shall bear all costs thereof, including the cost of the Owner's additional services made necessary by such failure, and the costs of such inspection or testing and other expenses related thereto, including without limitation Owner's legal fees, if any, incurred in connection with advising Owner of such failure of compliance; otherwise, the Owner shall bear such costs.

10.8.4 Required certificates of re-inspections or testing to secure compliance with Clauses 10.8.3.1 or 10.8.3.2 above shall be paid for by the Contractor.

10.8.5 If the Owner wishes to observe the inspections, tests or approvals required by this Paragraph 10.8, he will do so promptly and, where appropriate, at the source of supply.
10.8.6 Neither the observations of the OR or the Owner in their administration of the Construction Contract, nor inspections, tests or approvals by persons other than the Contractor, shall relieve the Contractor from his obligations to perform the Work in accordance with the Contract Documents.

10.9 LEGAL FEES AND COSTS. The prevailing party shall be entitled to recover its attorneys’ fees, any costs of suit, any expert witness fees and the actual cost of any test or inspection incurred in connection with any effort undertaken to enforce any of the terms of this Contract.

ARTICLE 11
TIME AND LIQUIDATED DAMAGES

11.1 CONTRACT TIME, LIQUIDATED DAMAGES AND RELATED PROVISIONS.

11.1.1 It is understood and agreed that the construction of the Work under the Contract Documents shall be commenced on the date stated in the Notice to Proceed issued by the Owner and shall be Substantially Complete by the Contractor no later than the number of consecutive calendar days from that date, which number is the Contract Time as specified in Paragraph 3.2, herein. The Contract Time is the period of time from (1) the date specified in the Notice to Proceed as the date upon which the Contractor is to commence the Work (the "Start Date"), through (2) the date when the agreed time for Substantial Completion of the construction of the Project expires (the "Finish Date"). The date of beginning, rate of progress, and time for completion are essential conditions of the Contract, and the Contractor agrees that said Work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will ensure full completion thereof within the Contract Time specified. It is expressly agreed that the Contract Time is reasonable.

11.1.2 If the Substantial Completion Date as defined in Subparagraph 11.1.3 for the Project or any Phase thereof occurs after the expiration of the Contract Time, the Contractor shall pay the Owner the amount or amounts stated in Article 3 as liquidated damages for each calendar day the Work remains incomplete after expiration of the Contract Time. These amounts are agreed upon because of the impracticability and extreme difficulty of ascertaining the actual damages the Owner would sustain. It is expressly agreed that the amounts of liquidated damages set forth herein are reasonable. Said amounts may be retained from time to time by the Owner from payments due the Contractor.

11.1.3 The date of the Substantial Completion of the Work, or designated portion thereof, is the date established by a Certificate of Substantial Completion prepared by the OR when construction is sufficiently complete, in accordance with the Contract Documents as they may have been modified by any Change Orders agreed to by the parties, so that the Owner may occupy the Project, or a designated portion thereof, if he so elects, for the use for which it is intended. Certification of a designated portion of the Work by the OR as being "Substantially Complete" and occupancy of that portion thereafter by the Owner shall neither release, or otherwise operate to excuse, the Contractor from his duty to complete the remainder of the Work within the Contract Time nor relieve the Contractor from any liability for not completing expeditiously the remainder of Work.

11.1.4 The Final Completion Date is the calendar date when all items of the Work are one hundred percent (100%) finished, with no items of any scope, large or small, outstanding and remaining
to be completed, and all known defective work has been corrected. When the Owner certifies in writing, pursuant to the terms of Subparagraph 12.6.2, that the Final Completion Date is reached and it is approved by the Owner, the Contractor may make application for final payment pursuant to Subparagraph 12.6.2.

11.2 PROGRESS AND COMPLETION.

11.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

11.2.2 The Contractor shall begin the Work on the Start Date as defined in Subparagraph 11.1.1. He shall carry the Work forward expeditiously with adequate forces and shall complete it as required herein.

11.3 DELAYS AND EXTENSIONS OF TIME.

11.3.1 If the Contractor is delayed at any time in the progress of the Work by any cause which the OR determines may justify the delay, including, but not limited to, unforeseeable cause beyond the control and without the fault or negligence of the Contractor, its agents and employees and Subcontractors and Sub-subcontractors and their agents and employees, including, but not restricted to: acts of God, acts of the public enemy, acts of the Owner, acts of another contractor in performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather over the entire Contract Time, then the Contract Time shall be extended by Change Order for such reasonable time as the OR may determine. No extension of the Contract Time pursuant to this paragraph shall relieve the Contractor from any obligation attendant upon him under any of the provisions of this Contract. It is expressly agreed that the Owner's liability for delay from any cause shall be limited to granting a time extension to the Contractor, and there is no other obligation, expressed or implied, on the part of the Owner to the Contractor for delay from any cause other than Owner caused delay. If the Contractor makes a claim for delay, as provided herein, for which he alleges that the Owner is responsible, which is unreasonable under the circumstances and which was not within the contemplation of the parties, the Owner agrees to negotiate with the Contractor the validity of such claim and the amount of damages incurred by the Contractor, if any.

11.3.2 The Contractor's Construction Progress Schedule must reflect the anticipated adverse weather delays on all weather dependent activities.

11.3.3 All claims for extension of time shall be made in writing to the Owner no more than fifteen (15) days after the occurrence of the delay; otherwise, they shall be waived. In the case of a continuing cause of delay, only one claim is necessary, and the Contractor shall promptly notify the Owner in writing of the date of the termination of the continuing cause of delay.

11.3.4 If no schedule or agreement is made stating the dates upon which written interpretations as set forth in Subparagraph 4.12.5 shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until fifteen (15) days after demand is made for them, and not then unless such claim is reasonable.
ARTICLE 12  
PAYMENTS AND COMPLETION  

12.1 CONTRACT AMOUNT. The Contract Amount is as stated in this Contract and General Conditions and is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents, subject to credits or increases resulting from Change Orders.

12.2 SCHEDULE OF VALUES. Before the first Application for Payment, the Contractor shall submit to the Owner a schedule of values reflecting as nearly as reasonably possible the actual values of the various components of the Work aggregating the total Contract Amount, prepared in such form as Owner may require, and supported by such data to substantiate its correctness as the Owner may require. Each item in the schedule of values shall include its proper share of overhead and profit. This schedule shall be used only as a basis for the Contractor's Application for Payment.

12.3 PROGRESS PAYMENTS IF PRE-AUTHORIZED BY OWNER  

12.3.1 On or about the first day of each calendar month during the course of construction, the Contractor shall submit to the Owner an itemized Application for Payment, which shall be AIA Document G702 and G703, supported by such data substantiating the Contractor's right to payment as the Owner may require.

12.3.2 Payments shall be based on the Work actually performed during the preceding calendar month. Payment may be made for materials not incorporated in the Work but delivered and suitably stored at the site under such conditions agreed upon in writing by the Owner.

12.3.3 Material delivered and suitably stored at the site by the Contractor, Subcontractors, Sub-subcontractors, or Material Vendors shall be insured to the full value of the material and shall be suitably stored and protected. Only such material that is in accordance with the Contract Documents shall be installed into the Work. Until the Final Completion and acceptance of the Work by the Owner, it shall be the Contractor's responsibility to protect all materials installed in or delivered to the Project.

12.3.4 The Contractor warrants and guarantees that title for all work, materials and equipment covered by the Contract Documents shall pass to the Owner upon Final Completion and acceptance by the Owner and that such work, materials and equipment shall be free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 12 as "claims".

12.4 CERTIFICATION OF PAYMENT.

12.4.1 If the Contractor has made Application for Payment as above, the OR shall approve or modify the Application and forward for payment for such amount as the OR determines to be properly due, or state in writing the OR's reasons for withholding, in whole or in part, the amount applied for as provided in Subparagraph 12.5.1.
12.4.2 The Application for Payment will constitute a representation by the Contractor to the Owner, that:

.1 the Work has progressed to the point indicated;

.2 to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole upon Substantial Completion, to the results of any subsequent tests required by the Contract Documents, to minor deviations from the Contract Documents correctable prior to Final Completion, and to any specific qualifications stated in his certification of the Application for Payment); and

.3 the Contractor is entitled to payment in the amount certified.

12.4.3 The Owner shall make a payment to the Contractor on the basis of the value of the Work actually performed during the preceding calendar month in accordance with Subparagraph 12.3.2, less the amount of retention specified in Subparagraph 12.4.5 hereof. Such payments shall be made within thirty (30) days after receipt of Application for Payment. If the Contractor has properly requested the Owner pursuant to Subparagraph 12.3.1 of this Contract and General Conditions to accept substitute security, the Owner shall pay to the Contractor one hundred percent (100%) of the value of the Work actually performed during the preceding calendar month in accordance with this Paragraph 12. If the Contractor did not request an acceptance of substitute security, made an incomplete or incorrect assignment or made a legally insufficient assignment of substitute security, as determined by Owner or Owner's attorney, the Owner shall retain the amount of such approved Application for Payment specified in Subparagraph 12.4.5 hereof as a guarantee of the complete performance of the Contract. Any amounts retained or any securities held by Owner shall be returned to the Contractor within sixty (60) days after the Final Completion Date as specified in Subparagraph 12.6.2 of this Contract and General Conditions, provided the Contractor has by that time duly furnished the Owner any and all documents indicated to be furnished by the close out requirements of the Specifications or required for the proper maintenance and functioning of the Work as a whole. The Contractor shall submit along with the Application for Payment lien waivers from each subcontractor, materials or equipment supplier, the aggregate sum of which shall be the amount of the previous progress payment issued to the Contractor. If lien waivers from all subcontractors, materials or equipment suppliers do not equal the aggregate sum of the previous progress payment, the Contractor shall submit the following statement along with the current progress payment request: "I hereby certify as General Contractor on this project that I have paid all subcontractors, materials or equipment suppliers, for the Work provided in conjunction with the Project for which I have previously received payment."

12.4.4 In his Application for Payment, or in a separate notice, the Contractor shall include and itemize, and furnish such supporting particulars as the Owner shall require, all claims for additional compensation against the Owner arising under the Contract Documents or any covenant thereof, express or implied, or from any cause whatsoever, within the time limits prescribed in Subparagraph 15.2.1. It is expressly covenanted that the purpose of this provision is to guard the Owner against surprise claims, to permit the Owner to investigate claims as the same may arise, and to prevent vexatious litigation of claims. It is expressly covenanted that the Owner shall have no liability on any claim unless such claim was submitted in writing at the time and in the manner required hereby.
12.4.5 The Owner shall retain ten percent (10%) of the amount of each Application for Payment as insurance of proper performance of the Contract. Once the Contract is fifty percent (50%) complete, one-half of the retention then held shall be paid to the Contractor provided the Contractor is making satisfactory progress and there is no specific cause or claim requiring a greater amount to be retained. After the Contract is fifty percent (50%) completed, five percent (5%) of the amount of each subsequent Application for Payment shall be retained provided the Contractor is making satisfactory progress on the Project. If at any time the Owner determines that the Contractor is not making satisfactory progress, then the Owner may retain ten percent (10%) of all subsequent Applications for Payment.

12.4.6 No certificate for a progress payment, nor an acceptance of any security in lieu of the cash retention, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

12.5 PAYMENTS WITHHELD.

12.5.1 The OR may decline to certify payment and may withhold his Certificate in whole or in part if, in his opinion, he is unable to make representations to the Owner as provided in Subparagraph 12.4.2. The OR may also decline to certify any Applications for Payment or, because of subsequently discovered evidence or subsequent inspections, he may nullify the whole or any part of any Certificate for Payment previously issued to such extent as may be necessary in his opinion to protect the Owner from loss because of:

.1 defective work not remedied,
.2 claims filed or reasonable evidence indicating probable filing of claims,
.3 reasonable doubt that the Work can be completed for the unpaid balance of the Contract Amount,
.4 damage to the Owner or another contractor,
.5 reasonable indication that the Work will not be completed within the Contract Time, or
.6 unsatisfactory prosecution of the Work by the Contractor.

12.5.2 When the grounds in Subparagraph 12.5.1 are removed, or in the case of 12.5.1.3 above, when the Owner is satisfied that the Contractor will complete the Project at the agreed upon price, payment shall be made for amounts withheld because of them.

12.6 SUBSTANTIAL COMPLETION AND FINAL PAYMENT.

12.6.1 When the Contractor believes that the Work or a designated portion thereof acceptable to the Owner is substantially complete, the Contractor shall prepare for submission to the OR a "punch list" of items to be completed or corrected. Any item on such list shall be completed or corrected before the
Final Completion Date without regard to whether such item may be characterized by anyone as a "warranty item" or otherwise. The failure to include any items on such punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the OR, on the basis of an inspection, determines that the Work or a portion thereof is substantially complete, he will then prepare a Certificate of Substantial Completion, which shall be AIA Document G704, which shall state the responsibilities of the Owner and the Contractor for maintenance, heat, utilities and insurance. The Certificate(s) of Substantial Completion shall be submitted to the Owner for their written acceptance of the responsibilities assigned to them in such Certificate.

12.6.2 Upon receipt of written notice from the Contractor that the Work is ready for final inspection and acceptance, the OR will promptly make such inspection and, when the OR finds (1) the Work acceptable under the Contract Documents; (2) the Contract fully performed; and (3) the Final Completion Date has been reached, as that term is defined in Subparagraph 11.1.4, then, and only then, the Contractor shall promptly issue a final Invoice stating that, to the best of his knowledge, information and belief, and on the basis of observations and inspections, the Work has been fully completed in accordance with the terms and conditions of the Contract Documents, that the entire balance found to be due the Contractor is payable, and that any securities held by the Owner in lieu of a cash retention are returnable. The Contractor's written notice required by this Paragraph shall state the Date of Final Completion.

12.6.3 Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Owner (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied; (2) consent of surety to final payment; (3) if required by the Owner, other data establishing payment or satisfaction of all such obligations, to the extent and in such form as may be designated by the Owner; and (4) written certification by the Contractor, and such subcontractors, material suppliers and manufacturers as the Owner shall designate, that no materials have been incorporated into the Work which contain any asbestos.

12.6.4 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except previously made in writing and still unsettled.

ARTICLE 13
PROTECTION OF PERSONS AND PROPERTY

13.1 SAFETY PRECAUTIONS AND PROGRAMS. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work in compliance with all local, state and federal laws and regulations.

13.2 SAFETY OF PERSONS AND PROPERTY.

13.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss, to:

.1 all employees engaged in the Work and all other persons who may be affected thereby;
13.2.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by existing conditions and the progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

13.2.3 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

13.2.4 All damage or loss to any property referred to in Clauses 13.2.1.2 and 13.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

13.2.5 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's Superintendent unless otherwise designated in writing by the Contractor to the Owner.

13.2.6 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

13.3 EMERGENCIES. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided by the applicable provisions of the Contract Documents.

ARTICLE 14
CONTRACTOR'S INSURANCE

14.1 GENERAL REQUIREMENTS The Contractor, at Contractor’s own expense, shall purchase and maintain the herein stipulated minimum insurance with companies duly licensed to do business in the State of Arizona with policies and forms satisfactory to the District and possessing a current A.M. Best, Inc. Rating of B++6.
All insurance required herein shall be maintained in full force and effect until all work required to be performed under the terms of the Contract is satisfactorily completed and formally accepted; failure to do so may, at the sole direction of the District, constitute a material breach of the Contract.

The Contractor’s insurance shall be primary insurance, and any insurance or self-insurance maintained by the District shall not contribute to it.

Any failure to comply with the claim reporting provisions of the policies or any breach of an insurance policy warranty shall not affect coverage afforded under the policy to protect the District.

All policies, except Workers’ Compensation, shall contain a waiver of transfer rights of recovery (subrogation) against the District, its agents, representatives, directors, officers, and employees for any claims arising out of the Contractor’s work or service.

The insurance policies may provide coverage which contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to the District under such policies. The Contractor shall be solely responsible for deductible and/or self-insured retention and the District, at its option, may require the Contractor to secure the payment of such deductible or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit.

The District reserves the right to request and to receive, within 10 working days, certified copies of any or all of the herein required insurance policies and/or endorsements. The District shall not be obligated, however, to review same or to advise Contractor of any deficiencies in such policies and endorsements, and such receipt shall not relieve Contractor from, or be deemed a waiver of the District’s right to insist on, strict fulfillment of Contractor’s obligations under the Contract.

The insurance policies, except Workers’ Compensation, required by the Contract shall name the District, its agents, representatives, officers, directors, officials, and employees as Additional Insureds.

14.2 REQUIRED COVERAGE

14.2.1 General Liability - Contractor shall maintain Commercial General Liability insurance with a limit of not less than $2,000,000 for each occurrence with a $2,000,000 Products and Completed Operations Aggregate and $2,000,000 General Aggregate Limit. The Contractor’s policy shall be endorsed to include a separate designated construction project general aggregate limit applicable to this project with a per project limit of $1,000,000 which coverage will be at least as broad as Insurance Service Office, Inc. Policy Form CG 25030397. The policies shall include coverage for bodily injury, broad form property damage, personal injury, products/completed operations and blanket contractual coverage including, but not limited to, the liability assumed under the indemnification provisions of the Contract, which coverage will be at least as broad as Insurance Service Office, Inc. Policy Form CG 000211093 or any replacement thereof. The coverage shall not exclude X, C, U.

Such policies shall contain a severability of interest provision, and shall not contain a sunset provision or commutation clause, or any provision that would serve to limit third party action over claims.
The Commercial General Liability additional insured endorsement shall be at least as broad as the Insurance Service Office, Inc.’s, Additional Insured, Form B CG20101185, and shall include coverage for Contractor’s operations and products and completed operations.

14.2.2 Certificates if Insurance - Prior to commencing Services under the Contract, Contractor shall furnish the District with Certificates of Insurance, or formal endorsements as required by the Contract, issued by Contractor’s insurer(s), as evidence that policies providing the required coverages, conditions and limits required by the Contract are in full force and effect.

In the event any insurance policy(ies) required by the contract is(are) written on a “claims made” basis, coverage shall extend for two years past completion and acceptance of the contractor’s work or services and as evidenced by annual Certificates of Insurance.

If a policy does expire during the life of the contract, a renewal certificate must be sent to the District thirty (30) days prior to the expiration date.

All Certificates of Insurance required by the Contract shall be identified with a bid serial number and title.

Insurance evidenced by these certificates shall not expire, be canceled, or materially changed without thirty (30) days prior written notice to the District.

14.2.3 Automobile Liability - Contractor shall maintain and cause any subcontractors to maintain Commercial/Business Automotive Liability insurance with a combined single limit for bodily injury and property damage of not less than $1,000,000 each occurrence with respect to the Contractor’s owned, hired, and non-owned vehicles assigned to or used in performance of the Contractor’s work. Coverage will be at least as broad as coverage code 1, “any auto”, (Insurance Service Office, Inc. Policy Form CA 00011293, or any replacements thereof). Such insurance shall include coverage for loading and off loading hazards. If hazardous substances, materials or wastes are to be transported, MCS 90 endorsement shall be included and $5,000,000 per accident limits for bodily injury and property damage shall apply.

14.2.4 Workers’ Compensation - This Contractor shall carry Workers’ Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of Contractor’s employees engaged in the performance of the work; and, Employer’s Liability insurance of not less than $2,000,000 for each accident, $1,000,000 disease for each employee, and $1,000,000 disease policy limit. In case any work is subcontracted, the Contractor will require the Subcontractor to provide Workers’ Compensation and Employer’s Liability to at least the same extent as required of the Contractor.
ARTICLE 15
CHANGES IN THE WORK AND CLAIMS

15.1 CHANGE ORDERS.

15.1.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions. The Contract Amount and/or the Contract Time shall be adjusted accordingly pursuant to the terms of the Contract Documents.

15.1.2 A Change Order is a written amendment to the Contract Documents signed by the Owner, OR and the Contractor, issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Amount or the Contract Time. The Contract Amount and the Contract Time may be changed only by Change Order.

15.1.3 The debit or credit, as the case may be, to the Owner resulting from a change in the Work shall be determined in one or more of the following ways as mutually agreed:

.1 by a lump sum properly itemized and supported as described below in order to permit evaluation;

.2 by unit prices stated in the Contract Documents or subsequently agreed upon; or

.3 by actual cost and specified percentage fee covering overhead and profit.

The total amount of overhead and profit allowed on any Change Order, whether increase or decrease, shall not exceed 15% of the direct costs of the Change Order Work when the Work is performed by the Contractor, or 5% of the Direct Costs for the Contractor's overhead and profit and 15% for the Subcontractor's overhead and profit when the Work is performed by any level of Subcontractor or Sub-subcontractor. The aforesaid amounts shall include the general conditions, overhead and profit for both the Contractor, Subcontractor(s), and Sub-subcontractor(s), if any. The costs of bond premiums and sales tax shall be added, in that order, after calculation and addition of overhead and profit.

The overhead and profit margin shall cover the costs of any additional supervision and project management, including the Contractor's and any Subcontractor's job superintendent, project manager, estimator, field office support, home office support, small tools and all other general conditions items.

For each and every proposed change in the Contract Amount, the Contractor shall provide an itemized breakdown of direct costs, hereinafter called the cost breakdown, that: (1) clearly describes each item, location and scope of work; (2) identifies in detail all labor (by trade classification), materials, equipment and services required to complete the work; (3) lists and extends all respective man hours (or unit hours), labor rates, quantities of materials, dimensions used to compute quantities, material units and unit prices, equipment time and rental rates. This cost breakdown shall be organized in a format that clearly identifies the subtotal of direct costs before overhead (if any), profit, bond and tax are added. The cost breakdown format is subject to the approval of the Owner.
Change bids from the Contractor shall include separate cost breakdowns as described above from any and all Subcontractors involved with the change. Subcontractor cost breakdowns are to be in writing on their letterhead and signed by the Subcontractor. Contractor shall provide any additional data needed to substantiate costs of changes, including invoices from suppliers and payroll information upon request of the Owner. The Contractor shall respond to requests for quotations from the Owner within five (5) calendar days.

The Direct Cost is defined as the lowest locally available cost to the Contractor or Subcontractor after all discounts, rebates and concessions are calculated. The Direct Cost is the basis for computing Contractor and Subcontractor overhead and profit margins. The Direct Costs that may be included in the price of a change are limited to the following items directly attributable to the change in the Work:

1. Costs of materials, including cost of delivery;
2. Cost of labor, including social security, old age and employment insurance, and fringe benefits required by agreement and workers’ compensation insurance;
3. Rental value of equipment used to perform the Work.

15.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order that application of the agreed unit prices to the quantities of Work proposed will create a hardship on the Owner or the Contractor, the applicable unit prices shall be equitably adjusted to prevent such hardship.

15.1.5 Should concealed conditions encountered in the performance of the Work below the surface of the ground be at variance with the conditions indicated by the Contract Documents or should unknown physical conditions below the surface of the ground of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Amount shall be adjusted by Change Order upon claim by either party made in compliance with Subparagraph 12.4.4 and within the time limits prescribed in Subparagraph 15.2.1.

15.1.6 If the Contractor claims that additional cost or time is involved because of:

.1 any written interpretation issued pursuant to Subparagraph 4.12.5,
.2 any order by the Owner to stop the Work pursuant to Subparagraph 5.2.11 where the Contractor was not at fault, or
.3 any written order for a minor change in the Work issued pursuant to Paragraph 15.3,
the Contractor shall make such claim as provided in Paragraph 15.2.
15.2 CLAIMS FOR ADDITIONAL COST OR TIME. If the Contractor decides to make a claim for an increase in the Contract Amount or any other claim, except one for an extension of Contract Time, he shall give the Owner written notice thereof within fifteen (15) days after the occurrence of the event giving rise to such claim or include such notice in the Application for Payment for the month in which the event giving rise to the claim occurred, whichever is earlier. Notice of a claim for extension of Contract Time shall be given within fifteen (15) days of the occurrence of the event giving rise to such claim. Any notice other than one made for an extension of the Contract Time shall be given by the Contractor before proceeding to execute the Work which is the subject matter of the claim, except in an emergency endangering life or property, in which case the Contractor shall proceed in accordance with Subparagraph 13.3.1. All claims shall be made as provided in Subparagraph 12.4.4 within the time limits prescribed herein, and no such claim shall be valid unless so made. No change in the Contract Amount or Contract Time resulting from such claim shall be valid unless approved by the Owner and authorized by Change Order.

15.3 MINOR CHANGES IN THE WORK. The OR has authority to order minor changes in the Work not involving an adjustment in the Contract Amount or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents.

15.4 FIELD INFORMATION MEMOS. The OR may issue written Field Information Memos which interpret the Contract Documents in accordance with Subparagraph 4.12.5 or which order minor changes in the Work in accordance with Paragraph 15.3 without change in Contract Amount or Contract Time. The Contractor shall carry out such changes specified in the Field Information Memos promptly.

ARTICLE 16
UNCOVERING AND CORRECTION OF WORK

16.1 UNCOVERING OF WORK.

16.1.1 If any Work should be covered contrary to the request of the OR, it must, if required by the OR, be uncovered for his observation and replaced, all at the Contractor's expense.

16.1.2 If any other Work has been covered which the OR has not specifically requested to observe prior to being covered, the OR may request to see such Work and it shall be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the cost of uncovering and replacement after approval by the OR shall, by appropriate Change Order, be charged to the Owner. If such Work is found not to be in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused by a separate contractor employed as provided in Article 9, and in that event, the Owner shall be responsible for the payment of such costs.

16.2 CORRECTION OF WORK.

16.2.1 The Contractor shall promptly correct all Work rejected by the Owner as defective or as failing to conform to the Contract Documents whether observed before or after Final Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work.
16.2.2 If, within two (2) years after acceptance of the Work by the Owner or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, including the original conformance with the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor, without cost to the Owner, shall correct it promptly after receipt of a written notice from the Owner to do so. The Owner shall give such notice promptly after discovery of the condition.

16.2.3 All such defective or non-conforming Work under Subparagraphs 16.2.1 and 16.2.2 shall be removed from the site where necessary, and the Work shall be corrected to comply with the Contract Documents without cost to the Owner.

16.2.4 The Contractor shall bear the cost of making good all work of separate contractors destroyed or damaged by such removal or correction.

16.2.5 If the Contractor does not remove such defective or non-conforming Work within a reasonable time fixed by written notice from the Owner, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days after receipt of a statement of charges therefor, the Owner may, upon ten (10) additional days written notice, sell such Work at auction or at private sale and shall account for the net proceeds thereof after deducting all the costs that should have been borne by the Contractor, including compensation for additional architectural services and any attorneys' fees incurred by Owner in connection therewith. If such proceeds of sale do not cover all costs which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner, and all attorneys' fees and other costs that the Owner may incur in collecting same.

16.2.6 If the Contractor fails to correct such defective or non-conforming Work, the Owner may correct it in accordance with Paragraph 10.6.

16.2.7 The obligations of the Contractor under this Paragraph 16.2 shall be in addition to and not in limitation of any obligations imposed upon him by special guarantees required by the Contract Documents or otherwise prescribed by law.

16.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK. If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the Contract Amount, or, if the amount is determined after final payment, it shall be paid by the Contractor.

ARTICLE 17
TERMINATION OF THE CONTRACT

17.1 TERMINATION BY THE CONTRACTOR. If the Work is stopped for a period of thirty (30) days, and the Owner is immediately notified of such stopping, under an order of any court or other public authority having jurisdiction through no act or fault of the Contractor or a Subcontractor or their
agents or employees or any other persons performing any of the Work under a contract with the Contractor, and by reason of some act or omission of Owner, then the Contractor may, upon thirty (30) days written notice to the Owner, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including the percentage profit stated in Paragraph 3.4 herein for Work accomplished through the date the notice of termination is given.

17.2 TERMINATION BY THE OWNER.

17.2.1 If the Contractor files or has filed against it any petition in bankruptcy, or if he makes a general assignment for benefit of his creditors, or if a receiver is appointed on account of his insolvency, or if he refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or sufficient and proper materials to complete the Work in accordance with the Progress Schedule and Contract Time, or he fails to make prompt payments to Subcontractors or for materials or labor, or disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a material breach of any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and/or his surety seven (7) days written notice, terminate the employment of the Contractor and take possession of the site and all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished. Termination of the Contract under this Subparagraph 17.2.1 shall not relieve the Contractor of any warranty obligations he would otherwise have on all Work performed hereunder, and such obligations shall survive termination of this Contract.

17.2.2 If the unpaid balance of the Contract Amount exceeds the costs of finishing the Work, including attorneys' fees and all other costs incurred by Owner in completion of the Contractor's obligations, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor shall pay the difference to the Owner.

ARTICLE 18
WARRANTY AND SITE CONDITIONS

18.1 TWO-YEAR WARRANTY.

18.1.1 The Contractor shall warrant all Work under this Contract against defects of material and workmanship for a period of at least two (2) years from the Final Completion Date; provided, however, that those items of the Work specified as having longer warranties shall be warranted for the period specified.

18.1.2 The Contractor shall be responsible for the total cost of repairing and restoring such defective Work to a new condition, at no cost to Owner.

18.1.3 In any case where the subject matter of the defect relates to Work done under a subcontract between the Contractor and any Subcontractor, it is the responsibility of the Contractor, not the Owner, to secure the Subcontractor's performance in compliance with this Paragraph and, in the
event of the Subcontractor's failure or refusal within a reasonable time to perform after notice, it shall be
the Contractor's responsibility to repair and restore such defective Work to a new condition, at no cost to
Owner.

18.1.4 In any case where the defective Work has been brought to the attention of the Contractor
by the Owner and the Contractor fails or refuses to correct it, the Owner may elect, without precluding
its use of any other remedy it may have available to it, to have the defective Work repaired and restored
to a new condition in whatever manner it deems appropriate, regardless of the cost, and the Contractor
shall be liable to the Owner for the total cost thereof, including, without limitation, any architectural and
legal fees related to effecting the repair.

18.1.5 Material and workmanship made good through compliance with such warranty shall be
subject to the same warranty period as the original materials and workmanship. Such warranty period
shall begin on the date the replaced material and work is certified as acceptable in writing by the Owner.

18.2 USE OF PREMISES.

18.2.1 The Contractor shall confine his equipment and plant, the storage of materials, and the
operations of his workmen to limits indicated by law, ordinances, permits, or directions of the Owner
and shall not unreasonably encumber the premises with materials or equipment.

18.3 SEVERABILITY. In the event any provision in this Contract is held invalid by any court
of competent jurisdiction, the remaining provisions in this Contract shall be deemed severable and shall
remain in full force and effect.

18.4 IMMIGRATION LAW COMPLIANCE.

18.4.1 The Contractor warrants compliance with the Federal Immigration and Nationality Act
(FINA) and all other Federal and State immigration laws and regulations related to the immigration
status of its employees. Contractor shall obtain statements from its subcontractors of every tier
certifying compliance and shall furnish the statements to the Owner upon request. These warranties
shall remain in effect through the term of the Contract, and the Contractor and its subcontractors of
every tier shall also maintain Employment Eligibility Verification forms (I-9) as required by the U.S.
Department of Labor’s Immigration and Control Act for all employees performing work pursuant to this
Contract. I-9 forms are available for download at USCIS.GOV.

18.4.2 The Owner may request, and the Contractor agrees to furnish, verification of compliance
from the Contractor or its subcontractors of any tier performing work pursuant to this Contract. Should
the Owner reasonably believe or discover that the Contractor or its subcontractors of any tier are not in
compliance, the Owner may pursue any and all remedies allowed by law, including, but not limited to:
suspension of work, termination of the Contract for default, and suspension and/or debarment of the
Contractor or its subcontractors. All costs necessary to verify compliance are the responsibility of the
Contractor.

18.5 CANCELLATION. This Agreement is subject to cancellation by the Owner for
violation of the provisions of Arizona Revised Statutes Section 38-511.
IN WITNESS WHEREOF, four (4) identical counterparts of this Agreement, each of which shall for all purposes be deemed an original thereof, have been duly executed by the parties hereinabove named, on the day and year first above written.

OWNER: Pima County Community College

By _________________________________ Date __________________
Its _________________________________

CONTRACTOR: _________________________________

By _________________________________ Date __________________
Its _________________________________
EXHIBIT A

West Campus Men’s Gym Locker Area Remodel

1. Project Manual/Specifications dated ____________, 201__.

2. Drawing List

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<th>Sheet Title</th>
<th>Sheet Date</th>
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CONSTRUCTION DOCUMENTS
March 27, 2015
FINISH FLOOR
CONTRACTORS ARE EXPECTED TO BE FAMILIAR WITH ALL OSHA REGULATIONS AND BE AWARE OF THE RISK OF ASBESTOS EXPOSURE.

PIMA COUNTY COMMUNITY COLLEGE DISTRICT FACILITIES PLANNING REPRESENTATIVE
ALL ACCIDENTS MUST BE REPORTED TO PCC ENVIRONMENTAL HEALTH AND SAFETY (EH&S)
AN ASBESTOS PLAN IS IN PLACE AT PCC; AREAS KNOWN TO CONTAIN ASBESTOS ARE CLEARLY MARKED.

THE CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED BY THE PROJECT.

INDEX TO DRAWINGS

PHASING PLAN

LOCATION MAP

AREA MAP

M E X I C O
FIRE EXTINGUISHER CABINET LOCATION
NUMBER OF OCCUPANTS USING EXIT
4'

SHOWERS
DAY-USE LOCKERS
SHOWERS

STAFF LOCKERS
STORAGE/LAUNDRY

TOILETS
TOILETS

VISITING LOCKERS
WOMEN'S VARSITY
LOCKERS

TRAY

ASSEMBLY GROUP A-4 OCCUPANCY

CODE REVIEW - 2012 IBC

Type of Construction (Table 503): Type IIB
Fire Resistance Ratings (Table 602): Type IIB

Type of Occupancy (Section 302): Assembly: Group A-4

Exits and Occupant Loads:

Distance to Exits (Table 1016.1): Less than 300' (w/ auto sprinkler system)

Number of Exits (Table 1019.1): Min. of 2 Req./Story

Width of Exits (Table 1005.1): 1,829 x .15" = 274" req., 432" provided

Number of Occupants Using Exit

Occupant Load (Table 1004.1.1):

Lavatories: Male: 1 per 200
Water Closets: Men: 1/75 for first 1,500 & 1/120 for remainder

Area of Refuge (1007.6): 2 required (1/200 occ.); second level exits to

Required Provided

Total Building Area: 38,052 sf (Unaffected by Project)
Second Floor Area: 13,016 sf
First Floor Area: 25,036 sf
Height: 2 Story, 36'
Allowable Area/Story: 9,500 sf
Acceptable Height: 2 stories, 55'

Non-Bearing Walls:
Bearing Walls: (Existing)
Structural Frame: (Existing)

Structural Frame: (Existing)

Floor Construction: 0
Roof Construction: 0
Shafts: 1
Stairway Enclosure: 0

Lavatories: Female: 1 per 150
Urinals: 0
Water Closets: 0

Distance to Exits (Table 1016.1)

Width of Exits (Table 1005.1)

Required Provided

Drinking Fountains:

Required Provided

Due to public/private separation, occupants are split into the following:

A. Gymnasium/Public Occupants:

Due to public/private separation, occupants are split into the following:

Due to public/private separation, occupants are split into the following:

A. Gymnasium/Public Occupants:

Due to public/private separation, occupants are split into the following:

Due to public/private separation, occupants are split into the following:

1,777 Occupants/2 = 888 male, 889 female

64 Occupants/2 = 32 male, 32 female

Required Provided

Due to public/private separation, occupants are split into the following:

3. Section B-2 (Unaffected by Project)

Due to public/private separation, occupants are split into the following:

3. Section B-2 (Unaffected by Project)

Due to public/private separation, occupants are split into the following:

3. Section B-2 (Unaffected by Project)

Due to public/private separation, occupants are split into the following:

3. Section B-2 (Unaffected by Project)

Due to public/private separation, occupants are split into the following:

3. Section B-2 (Unaffected by Project)
1. REMOVE EXISTING MASONRY WALLS & LUMBER - CAP UTILITIES AS REQ.
2. REMOVE EXISTING FRAMED PARTITION - CAP UTILITIES AS REQ.
3. REMOVE EXISTING MASONRY PARTITION - CAP UTILITIES AS REQ.
4. REMOVE EXISTING FLOORING, WALL BASE & CEILING - REF BOUNDARY LINE
5. REMOVE EXIST. DOOR, FRAME (& GLAZING WHERE OCCURS)
6. REMOVE EXIST. FLOORING, WALL BASE & CEILING - REF BOUNDARY LINE
7. REMOVE EXISTING FRAMED PARTITION - CAP UTILITIES AS REQ.
8. REMOVE EXIST. SHOWER UTILITIES (& PAN WHERE OCCURS)
9. REMOVE EXIST. FLOOR TILE, TILE CURB & FLOOR DRAIN  - CAP AS REQ.
10. REMOVE EXIST. SINK & MIRROR ABOVE - CAP UTILITIES AS REQ.
11. REMOVE EXIST WALL-HUNG WATER CLOSET - CAP UTILITIES AS REQ.
12. REMOVE EXIST. COUNTER (& SINK/WALL MIRROR WHERE OCCURS)
13. REMOVE EXISTING CHAIN-LINK FENCE & GATES
14. REMOVE EXISTING FRAMED PARTITION - CAP UTILITIES AS REQ.
15. REMOVE EXISTING STAIR & RAILING
16. REMOVE EXISTING FRAMED PARTITION - CAP UTILITIES AS REQ.
17. REMOVE EXISTING MASONRY PARTITION - CAP UTILITIES AS REQ.
18. REMOVE AND SALVAGE EXISTING FULL-HEIGHT LOCKERS, INSTALL AT SAME LOCATION
19. REMOVE EXISTING WALL-HUNG URINAL - CAP UTILIES AS REQ.
20. REMOVE EXISTING WASHER AND DRYER UNITS
21. REMOVE EXIST. GRAB BARS, TOILET PAPER DISPENSERS & TOILET ACCESSORIES
22. REMOVE EXIST. BENCH AND SUPPORTS
23. REMOVE EXISTING ICE MACHINE
24. REMOVE AND SALVAGE (15) EXISTING WOOD LOCKERS REF 1/A2.1
25. REMOVE EXISTING ACT CEILING IN ENTIRE ROOM
26. REMOVE EXISTING ACT CEILING IN ENTIRE ROOM
27. REMOVE EXISTING ICE MACHINE
28. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
29. REMOVE EXISTING ICE MACHINE
30. REMOVE EXISTING ACT CEILING IN ENTIRE ROOM
31. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
32. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
33. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
34. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
35. REMOVE ABANDONED ON/OFF SWITCH ABOVE DRINKING FOUNTAINS & WALL MOUNTED HANDRAIL TO REMAIN
36. REMOVE ALL EXISTING ABANDONED BLEACHER TIES MOUNTED BELOW 9'-0" & PATCH/SEAL OPENING ON THIS WALL
37. REMOVE AND REPLACE EXISTING DRINKING FOUNTAINS - RE: NEW FLOOR PLAN FOR NEW DRINKING FOUNTAIN WALL ONLY.

DEMOLITION GENERAL NOTES

5. REMOVE EXISTING CHAIN-LINK FENCE & GATES
4. REMOVE EXISTING FLOORING, WALL BASE & CEILING - REF BOUNDARY LINE
3. REMOVE EXISTING AL. RAILINGS CAST INTO CONCRETE RAMP, REFER TO A2.1 FOR NEW HANDRAIL, EXISTING WALL MOUNTED HANDRAIL TO REMAIN
2. REMOVE EXISTING FRAMED PARTITION - CAP UTILITIES AS REQ.
1. REMOVE EXISTING MASONRY PARTITION - CAP UTILITIES AS REQ.
1. See architectural reflected ceiling plans for locations and extent of soffits.

2. See plans and interior elevations for locations and extent of various finish materials if more than one material is noted for individual room or space in the room finish schedule.

3. For areas with ceramic tile (CT) finish, refer to "Typical Wall Tile Layout" on A6.1.

---

**ROOM FINISH SCHEDULE**

**ROOM FINISH ABBREVIATIONS**

CONC - Concrete - Exposed
CPT - Carpet
CT - Ceramic Tile
ES - Exposed Structure
EXIST - Existing
GWB - Gypsum Wall Board
MTL - Metal
P - Paint
RB - Rubber Base
RES - Resinous Flooring
RESB - Resinous Base
WB - Wood Base
WOC - Walk-on Carpet

**ROOM FINISH SCHEDULE GENERAL NOTES**

1. All finish materials are detailed on associated drawings for locations and extent of surfaces.
2. Use of color, finish, and locations for typical construction is subject to change. Consult plan notes for accuracy.
3. Refer to typical and floor plans for accuracy.

**LIST OF MATERIALS & FINISHES**

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<tr>
<th>NUMBER</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>B-G26</td>
<td>483 SF OFFICE / STORAGE</td>
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<td>B-G27</td>
<td>12 SF FIRE RISER ROOM</td>
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<td>B-G30</td>
<td>399 SF DAY-USE LOCKERS</td>
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<tr>
<td>B-G31</td>
<td>281 SF VISITING LOCKERS</td>
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<td>B-G33</td>
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<td>164 SF TOILETS</td>
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<td>680 SF MEN'S VARSITY LOCKERS</td>
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<tr>
<td>B-G40</td>
<td>262 SF STAFF LOCKERS</td>
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<td>77 SF VESTIBULE</td>
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**DURABLE FLOOR FINISHES**

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**PAINT**

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<tr>
<td>P-1</td>
<td>DE-382 &quot;Faded Gray&quot;</td>
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<td>Pima College / Aztec Blue</td>
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**RESINOUS FLOORING - RES**

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**GROUT**

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<td>WALL</td>
<td>Custom Building Products #115 Platinum</td>
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**ROOM SCHEDULE**

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<th>WALLS</th>
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<th>FINISH BASE</th>
<th>NORTH</th>
<th>EAST</th>
<th>SOUTH</th>
<th>WEST</th>
<th>SURFACE FINISH</th>
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RESTROOM KEYNOTES

1. SURFACE-MOUNTED SINK - REF SPECS
2. SOLID SURFACE COUNTER
3. TOILET PARTITION - REF SPECS
4. WALL-HUNG WATER CLOSET - REF SPECS
5. ADA GRAB BARS - REF SPECS
6. ADA SHOWER BENCH - REF TYP MOUNTING HEIGHTS
7. WALL-HUNG MIRROR
8. SOAP DISPENSER - O.F.O.I.
9. TOILET PAPER DISPENSER - O.F.O.I.
10. 6"x8"x16" CMU BLOCK, PAINTED
11. 7'-0" HIGH WALL TILE - REF TYP TILE LAYOUT/A6.1
12. GYP. WALL BOARD, PAINTED
13. COUNTERTOP SUPPORT BRACKET (18"x18") @ 2'-0" O.C.
14. EXISTING LOCKERS
15. CLOTHES HOOK 5'-8" A.F.F. U.N.O. - REF SPECS
16. SHOWER CURTAIN AS REQ. FOR OPENING 6'-6" A.F.F.
20. WALL TILE CT-1 TO 4' A.F.F.
23. SHOWER HEAD
24. CHANGING SEAT - CERAMIC TILE ON CMU
25. RECESSED SHOWER SHELF - CERAMIC TILE ON FRAMING
26. ADA CHANGING BENCH - REF 9/A9.1
QUARTZ COUNTER WITH RADIUS EDGE
FULL APPLICATION OF PLYWOOD SHEATHING BELOW COUNTERTOP - PAINT (P-1)

STANDARD COUNTER BRACKET @ 24" O.C - PAINT (P-1); RE: SPECS

4" QUARTZ COUNTERTOP ON 3/4" PLYWD BASE
2x3 SUPPORTS UNDERNEATH QUARTZ BACKSPLASH
QUARTZ FRONT 2 3/4"
SINK, AS SPECIFIED REF. ELEV. 4"
ADA REQUIRED CLEARANCE

PLAN VIEW
NOM 1X6 COMPOSITE LUMBER MEMBERS, ARCHITECT TO SELECT COLOR

METAL FRAMED WALL WITH 20 GA DOUBLE STUDS AT ANCHORS

ELEVATION
NOM. 1X6 COMPOSITE LUMBER MEMBERS WITH RECESSED FASTENERS - ARCHITECT TO SELECT COLOR
DOUBLE 20 GA STUDS CONCEALED IN FRAME WALL ANCHOR TO STUDS AT 14" O.C.

WALL TILE OVER FRAMED ASSEMBLY NOM. 1X6 COMPOSITE LUMBER MEMBERS, ARCHITECT TO SELECT COLOR
STANDARD COUNTER BRACKET - PAINT (P-1); RE: SPECS

SECTION
TILE WALL BASE
NOM. 1X6 COMPOSITE LUMBER MEMBERS,
ARCHITECT TO SELECT COLOR
DOUBLE 20 GA STUDS AT EACH ANCHOR

BULLNOSE EDGE, TYP. CERAMIC TILE FLOOR FINISH
CERAMIC TILE AT HORIZONTAL SURFACE OF BENCH
CERAMIC TILE AT VERTICAL SURFACE OF BENCH
8x8x16 CMU
CMU CAP BLOCK
1' - 6" 7"
1' - 2" 7"

CONSULTANTS
2202 West Anklam Rd - Bldg B
Tucson, AZ 85709

MECHANICAL
KC Mechanical
5447 E. Fifth Street #112
Tucson, AZ 85711
Phone: 520.327.7611
Fax: 520.327.0432
Email: kenc@kcmech.net

ELECTRICAL
monrad Engineering
1926 E. Ft. Lowell Rd, Suite 200
Tucson, AZ 85719
Phone: 520.884.0045
Fax: 520.884.0048
Email: fernandogalvez@monradengineering.com

STRUCTURAL
Turner Structural Engineering
3026 N. Country Club Rd.
Tucson, AZ 85716
Phone: 520.323.3422
Fax: 520.323.0479
Email: mturner@turnerstructural.com

ARCHITECTS
261 North Court Avenue
Tucson, Arizona 85701
520.795.2705   Fax 520.795.6171
www.bwsarchs.com

CERTIFICATE NO. 23533
REGISTRATION NO. 4158
Date Signed: ...

JOB NO:
DATE:
REVISIONS
DRAWN BY:

2007 West Axtmann Rd. Bldg B
Tucson, AZ 85709

A9.1
MECHANICAL GENERAL NOTES

1. COORDINATE ALL MECHANICAL WORK WITH ALL OTHER TRADES. VERIFY ALL EXISTING CONDITIONS BEFORE THE START OF WORK.

2. PROVIDE ALL REQUIRED REMOVAL OF EXISTING MECHANICAL EQUIPMENT, MATERIALS AND OTHER ITEMS WHICH ARE NOT TO BE REUSED IN NEW DESIGN. ALL ITEMS WHICH THE OWNER DOES NOT WISH TO SALVAGE SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.

3. ALL EXISTING CHIMNEYS SHALL BE ATTACHED WITH THICKNESS OF 16 GAUGE STAINLESS STEEL EXTENDED TO COMPARE WITH EXISTING CHIMNEYS TO ENSURE SIMILARITY TO EXISTING MODEL. ALL EXISTING CHIMNEYS SHALL BE INSPECTED FOR COMBUSTIBILITY PRIOR TO DEMOLITION.

4. COORDINATE EXACT LOCATION OF ALL AIR DEVICES WITH ARCHITECTURAL REFLECTED CEILING PLAN.

5. ALL LOW VOLTAGE CONTROL WIRING AND ITS INSTALLATION TO BE PER ELECTRICAL SPECIFICATIONS. MOUNTING HEIGHT OF THERMOSTATS SHALL BE PER ADA REQUIREMENTS.

6. MECHANICAL CONTRACTOR SHALL REVIEW ALL ELECTRICAL DRAWINGS BEFORE PURCHASING EQUIPMENT TO ENSURE THAT PROPER ELECTRICAL SERVICE IS TO BE PROVIDED FOR ALL NEW EQUIPMENT.

MECHANICAL RELATED INFORMATION:

1. EXISTING AIR HANDLER TO REMAIN

2. EXISTING DUCTWORK TO REMAIN (TYPICAL)

3. EXISTING DUCTWORK TO BE REMOVED (SHOWN DASHED, TYP. )

4. EXISTING AIR DEVICE TO BE REMOVED

5. CAP EXISTING DUCTWORK AND SEAL AIRTIGHT WHERE AIR DEVICE WAS REMOVED.

6. EXISTING TEMPERATURE SENSOR TO BE RELOCATED

7. EXISTING TEMPERATURE SENSOR TO REMAIN

8. EXISTING TRANSFER AIR SYSTEM TO REMAIN, AIR DEVICES TO BE REPLACED AS INDICATED

9. EXISTING 2" DIA DRYER EXHAUST DUCT AND WALL CAP TO BE REMOVED. PATCH WALL AS REQUIRED TO MATCH EXISTING.
EXISTING EXHAUST DUCT
EXISTING EXHAUST FAN—BALANCE TO 200 CFM

NOTE: UNLESS NOTED OTHERWISE ALL DUCTWORK SHOWN ON 2ND FLOOR IS FOR REFERENCE ONLY

TRANSITION FROM NEW FAN INLET OPENING TO EXISTING DUCT AS REQUIRED, FIELD VERIFY EXACT DUCT SIZE PRIOR TO FABRICATING DUCTWORK.

Designers Mech: Plumb:
MECHANICAL ENGINEERING, L.L.C.

ARCHITECTS
BURNS WALD-HOPKINS SHAMBACH ARCHITECTS

MECHANICAL

ELECTRICAL

PIMA COMMUNITY COLLEGE
West Campus Gym Renovation

March 27, 2014

1/8" = 1'-0"
PLUMBING GENERAL NOTES

1. COORDINATE ALL WORK WITH ALL OTHER TRADES. START WORK IN THE ORDER THAT IS MOST Compatible with the needs of all other trades.
2. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS INCLUDING PIPING LOCATIONS, SIZES, AND DIRECTIONS OF FLOW BEFORE THE CONTRACTOR INSTALLS ANY NEW PLUMBING AND EaSTING Systems.
3. PROVIDE REQUIRED COMPONENTS OF EXISTING PLUMBING equipment, fixtures, materials and other items which are to be reused in new design. ALL ITEMS WHICH THE OWNER DOES NOT WISH TO SALVAGE SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.
4. ALL PLUMBING FIXTURES AND EQUIPMENT IDENTIFIED BY A "P" NUMBER SHALL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR, UNLESS NOTED OTHERWISE. SEE PLUMBING SCHEDULES.
5. PROVIDE REQUIRED DEMOLITION OF EXISTING PLUMBING EQUIPMENT, FIXTURES, MATERIALS AND OTHER ITEMS WHICH ARE NOT TO BE REUSED IN NEW DESIGN. ALL ITEMS WHICH THE OWNER DOES NOT WISH TO SALVAGE SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.
6. WHERE SHUT-OFF VALVE OR OTHER DEVICES ARE CONCEALED IN A HARD CEILING, PROVIDE ACCESS DOORS. SEE SPECIFICATIONS.

PLUMBING SCHEDULE

1. EXISTING 4"S MAIN.
2. EXISTING 3"CW MAIN UP.
3. EXISTING 3"CW MAIN RISE INTO BUILDING WITH SOV.
4. EXISTING 2"HW MAIN AND 1"HWR RISE INTO BUILDING FROM TUNNEL.
5. EXISTING 2"CW UP TO 2ND FLOOR TO REMAIN.
6. EXISTING 1"CW & HW UP TO 2ND FLOOR TO REMAIN.
7. EXISTING 1/2"HWR UP TO 2ND FLOOR TO REMAIN.
8. EXISTING 4"S DOWN FROM 2ND FLOOR TO REMAIN.
9. EXISTING 3"S DOWN FROM 2ND FLOOR TO REMAIN.
10. EXISTING 2"V UP TO 2ND FLOOR TO REMAIN.
11. EXISTING 4"V UP TO 2ND FLOOR TO REMAIN.
12. REMOVE ALL EXISTING PLUMBING FIXTURES IN THIS AREA. REMOVE ALL S.
13. REMOVE CW, HW, HWR, & V BACK TO MAINS AND CAP. HW RETURN LOOP TO REMAIN CONNECTED.
14. REMOVE 2 1/2"CW & HW BACK TO SOV FOR RECONNECTION PER NEW WORK PLAN.
15. REMOVE 1 1/2"CW & 3/4"HW BACK TO SOV FOR RECONNECTION PER NEW WORK PLAN.
16. REMOVE 4"S FOR REPLACEMENT PER NEW WORK PLAN.
17. REMOVE 1 1/2"CW & 3/4"HW BACK TO SOV FOR RECONNECTION PER NEW WORK PLAN.
18. REMOVE 2 1/2"CW & 2"HW BACK TO SOV FOR RECONNECTION PER NEW WORK PLAN.
19. REMOVE EXISTING DRINKING FOUNTAIN. SALVAGE TO OWNER.
20. EXISTING ICE MACHINE TO BE RELOCATED BY OWNER.
21. EXISTING MOP SINK TO REMAIN.
22. EXISTING UTILITY TUNNEL BELOW.
THE BUILDING CONTAINS AN EXISTING WET PIPE SPRINKLER SYSTEM. THE CONTRACTOR SHALL MODIFY THIS SYSTEM TO CONFORM TO THE NEW ARCHITECTURAL FLOOR PLAN. LOCATION OF SPRINKLER HEADS SHALL BE SPECIFIED ON THE ARCHITECTURAL FLOOR PLAN. PROVIDE ALL NEW SPRINKLER HEADS IN AREA OF NEW WORK. PROVIDE NEW CONCEALED TYPE SPRINKLER HEADS IN LOCKER ROOM AREAS. THE SYSTEM PROVIDED SHALL COMPLY WITH ALL REQUIREMENTS OF NFPA, LOCAL AND FEDERAL CODES WHICH GOVERN SUCH WORK AND THE DETAILED CALCULATIONS AND SHOP DRAWINGS FOR APPROVAL BY THE GOVERNING AGENCY.

FOR CONSTRUCTION — NFPA 13
IDENTIFICATION OF HAZARD: LIGHT HAZARD
DESIGN DENSITY: 0.10 GPM PER 1500 SQ.FT.
HYDRANT LOCATION: P13
DATE OF TEST: P13
TEST RESULTS: P13
INFORMATION SUPPLIED BY: P13
NOTE: FIRE PROTECTION CONTRACTOR SHALL VERIFY TEST RESULTS PRIOR TO THE START OF WORK.

PLUMBING KEYNOTES
1. EXISTING 4"S MAIN.
2. EXISTING 3"CW MAIN UG.
3. EXISTING 3"CW MAIN RISE INTO BUILDING WITH SOV.
4. EXISTING 2"HW MAIN AND 1"HWR UP FROM TUNNEL.
EXISTING 2"CW UP TO 2ND FLOOR TO REMAIN.
EXISTING 1"CW & HW UP TO 2ND FLOOR TO REMAIN.
EXISTING 1/2"HWR UP TO 2ND FLOOR TO REMAIN.
5. EXISTING 4"V UP TO 2ND FLOOR TO REMAIN.
6. CONNECT NEW 2"CW & 1 1/4"HW TO EXISTING SOV.
7. CONNECT NEW 1 1/2"CW & HW TO EXISTING SOV.
8. CONNECT NEW 1 1/2"CW & 3/4"HW TO EXISTING SOV.
9. PROVIDE WALL OR CEILING ACCESS PANEL FOR WATER HAMMER ARRESTOR AND SOV ACCESS.
10. CONNECT NEW 1/2" HWR TO EXISTING SOV. PROVIDE NEW CIRCUIT IF THERE IS NONE EXISTING AND BALANCE TO 2 GPM.
11. CONNECT NEW 2"CW TO EXISTING SOV.
12. PROVIDE WALL OF CLOSE ACCESS PANEL FOR WATER HAMMER ARRESTOR AND SOV ACCESS.
13. CONNECT NEW 1/2"V TO EXISTING SOV. PROVIDE NEW CIRCUIT IF THERE IS NONE EXISTING AND BALANCE TO 2 GPM.
14. EXISTING UTILITY TUNNEL BELOW
<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 inch</td>
<td>COLD WATER LINE</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>HOT WATER LINE</td>
</tr>
<tr>
<td>1 inch</td>
<td>CONDENSATE LINE</td>
</tr>
<tr>
<td>1 inch</td>
<td>SOIL OR WASTE LINE</td>
</tr>
<tr>
<td>1 inch</td>
<td>ELBOW UP</td>
</tr>
<tr>
<td>1 inch</td>
<td>ELBOW DOWN</td>
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<tr>
<td>2 inches</td>
<td>TEE UP</td>
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<tr>
<td>3 inches</td>
<td>TEE DN</td>
</tr>
<tr>
<td>4 inches</td>
<td>SOIL OR WASTE LINE</td>
</tr>
<tr>
<td>4 inches</td>
<td>P COUPLING</td>
</tr>
<tr>
<td>6 inches</td>
<td>WALL CLEANOUT</td>
</tr>
<tr>
<td>8 inches</td>
<td>EXIST</td>
</tr>
<tr>
<td>8 inches</td>
<td>FLOOR CLEANOUT</td>
</tr>
<tr>
<td>12 inches</td>
<td>WATER HAMMER ARRESTOR</td>
</tr>
</tbody>
</table>

**PLUMBING SYMBOLS AND LEGEND**

- **WATER HAMMER ARRESTOR/TRAP PRIMER**
- **ACCESS PANEL, ALUMINUM OR STAINLESS STEEL CONSTRUCTION, 8"x8" MINIMUM**
- **CW MAIN LINE**
- **WATER HAMMER ARRESTOR, MOUNT AS CLOSE AS POSSIBLE TO MAIN LINE**
- **SOV (BALL VALVE)**
- **HW HWR (GATE VALVE)**
- **SHUT OFF VALVE (BALL VALVE)**
- **SHUT OFF VALVE (GATE VALVE)**
- **TEMPERATURE & PRESSURE RELIEF HOSE BIBB**
- **12" MAXIMUM**
- **WATER HAMMER ARRESTOR/TRAP PRIMER**
- **NO SCALE**

**WATER FIXTURE UNITS**

- 10 FU
- 8 1.5 FU

**TOTAL Fixtures**

- 46.5
- 122
- 56
- 425

**WATER FIXTURE UNITS**

- 1.5
- 12
- 42
- 22

**PRODUCTS**

- **"PROFLOW #PF1723WH" FLUSH VALVE WATER CLOSET, 1.6 GAL./FLUSH MAX, VITREOUS CHINA, FLOOR MOUNTED, ENLON GATED BOWL.**
- **"SLOAN #111" FLUSH VALVE, 1.6 GAL./FLUSH.**
- **"PROFLOW #PFTSCOF2000WH" OPEN FRONT SEAT, SELF-SUSTAINING CHECK HINGES, ENLONGATED.**
- **"KOHLER 'STEWARD S' #K-4917" WALL HUNG URINAL, WATERLESS, VITREOUS CHINA, REMOVABLE STRAINER.**
- **PROVIDE UNIVERSAL MOUNTING BRACKETS. MOUNT PER ADA REQUIREMENTS, 17" HIGH RIM.**
- **"KOHLER STEWARD S #K-4917" WALL HUNG URINAL, WATERLESS, VITREOUS CHINA, REMOVABLE STRAINER. PROVIDE UNIVERSAL MOUNTING BRACKETS. MOUNT AT ADULT HEIGHT, 24" HIGH RIM.**
- **PROVIDE (2) 128 OZ. SEALING LIQUID BOTTLES, (2) PACKAGES URINAL BALL AND (2) 32 OZ. CLEANER BOTTLES.**
- **"AMERICAN STANDARD 'OVALYN' #0495.221" UNDERMOUNT LAVATORY, VITREOUS CHINA WITH MOUNTING KIT.**
- **"DELTA #86T1153" METERING FAUCET, 0.5 GPM, 0.25 GAL LONS MAX PER CYCLE. PROVIDE CAST BRASS, CHROME PLATED PERFORATED DRAIN, OFFSET CAST BRASS 'P' TRAP, LOOSE KEY ANGLE STOPS & SUPPLIES.**
- **PROVIDE ASSE CERTIFIED THERMOSTATIC MIXING VALVE EQUAL OF "WATTS #USG-B" W/ 3/8" FITTINGS. INSTALL PER ADA REQUIREMENTS WITH 34" AFF COUNTERTO P AND LAVATORY 3" FROM FRONT EDGE OF COUNTERTOP.**
- **"SYMMONS #FSB" HAND HELD SPRAY UNIT, 72" LONG FLEXIBLE HOSE, IN-LINE VACUUM BREAKER, 48" VERTICAL SLIDE BAR.**
- **"CHICAGO FAUCETS #1902-CP" THERMOSTATIC PRESSURE BALANCING MIXING VALVE, INTEGRAL STOPS.**
- **"BRADLEY #1C-SF-AKV" SHOWERHEAD, INSTITUTIONAL WALL ARM WITH BALL JOINT & ADJUSTABLE HEAD, FLUSH MOUNTED WALL FLANGE, TAMPER RESISTANT ALLEN HEAD SCREWS, ALLEN KEY VOLUME CONTROL.**
- **"ELKAY #EZSTL8C" TWO STATION, VANDAL-RESISTANT, BARRIER-FREE WATER COOLER. 8.8 GPH CAPACITY OF 50 DEG. F WATER AT 80 DEG. F AMBIENT TEMPERATURE, 4.0 FLA, 120V/1P/60HZ PROVIDE CAST BRASS 'P' TRAP & McQURE CHROME PLATED LOOSE KEY ANGLE STOPS & SUPPLIES.**
- **"ZURN #Z415B" FLOOR DRAIN, COATED CAST IRON BODY, ADJUSTABLE 5" ROUND NICKEL BRONZE STRAINER, SEDIMENT BUCKET. PROVIDE "PROSET" TRAP GUARD. TOTAL FIXTURE UNITS * PER 2012 IPC SECTION 604.1, THE WATER PIPE SIZE TO CONFORM TO AN ACCEPTED ENGINEERING PRACTICE. PIPE SIZE IS BASED ON USING 2012 UPC APPENDIX A THAT IS AN ACCEPTED ENGINEERING PRACTICE AND IS BASED ON LOW FLOW FIXTURES.**
PIMA COMMUNITY COLLEGE
WEST CAMPUS - GYM RENOVATION [PHASE 2]

Tucson, Arizona

CONSTRUCTION DOCUMENTS
27 MARCH 2015

bws ARCHITECTS

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Fax: 520.884.0046

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Fax: 520.323.0479
Pima Community College
WEST CAMPUS GYMNASIUM RENOVATION – PHASE 2
CONSTRUCTION DOCUMENTS

PROJECT MANUAL
Pima Community College
WEST CAMPUS GYMNASIUM RENOVATION – PHASE 2

CONSTRUCTION DOCUMENTS

March 27, 2015

Division 1 – General Requirements
011100 Summary of the Work
012100 Allowances
012300 Alternates
012400 Value Analysis
012500 Substitution Procedures
012600 Contract Modification Procedures
012900 Applications for Payment
013119 Project Meetings
013200 Construction Progress Documentation
013300 Submittal Procedures
014100 Regulatory Requirements
015000 Temporary Facilities and Controls
015100 Temporary Utilities
015200 Construction Facilities
015500 Vehicular Access and Parking-
015600 Temporary Barriers and Enclosures
016000 Product Requirements
016500 Product Delivery Requirements
017329 Cutting and Patching
017736 Warranties
018930 Selective Demolition

TECHNICAL SPECIFICATIONS

Division 2 – Existing Conditions - NA

Division 3 - Concrete
033000 Cast-In-Place Concrete

Division 4 - Masonry
042000 Unit Masonry

Division 5 - Metals
055000 Metal Fabrications
055213 Aluminum Handrails
## Division 6 – Wood, Plastics, and Composites
- 061000 Rough Carpentry
- 064023 Architectural Woodwork

## Division 7 - Thermal and Moisture Protection
- 079200 Joint Sealers

## Division 8 - Doors and Windows
- 081113 Steel (Hollow Metal) Doors and Frames
- 081416 Flush Wood Doors
- 087100 Door Hardware and Hardware Schedule

## Division 9 – Finishes
- 092900 Gypsum Drywall Systems
- 093000 Tile
- 096723 Resinous Flooring
- 099100 Painting

## Division 10 – Specialties
- 101000 Markerboards
- 102113 Toilet Compartments
- 102800 Toilet Accessories
- 104413 Fire Extinguishers and Cabinets
- 105115 All-Welded Lockers

## Division 11 – Equipment – Not Used

## Division 12 – Furnishings – Not Used

## Division 13 - Special Construction – Not used

## Division 14 – Conveyances – Not Used

## Division 21- Fire Protection
- 210500 Common Work Results for Fire Suppression
- 210529 Supports, Anchors, and Sleeves for Fire Suppression
- 211313 Wet Pipe Sprinkler Systems

## Division 22 – Plumbing
- 220500 Common Work Results for Plumbing
- 220523 Valves for Plumbing
- 220529 Supports, Anchors and Sleeves for Plumbing
- 220700 Plumbing Piping Insulation
- 221116 Plumbing Piping
- 221119 Plumbing Specialties
- 224000 Plumbing Fixtures

## Division 23 – Heating, Ventilating and Air Conditioning
- 230500 Common Work Results for HVAC
- 230529 Hangers and Supports for HVAC Piping and Equipment
230593  Testing, Adjusting, and Balancing for HVAC
233113  Ductwork
233115  Duct Insulation
233300  Air Duct Accessories
233423  HVAC Power Ventilators
233713  Diffusers, Registers, and Grilles

Division 26 – Electrical
260500  Common Work Results for Electrical
260519  Low-Voltage Electrical Power Conductors and Cables
260526  Grounding and Bonding for Electrical Systems
260529  Hangers and Supports for Electrical Systems
260533  Raceway and Boxes for Electrical Systems
260553  Identification for Electrical Systems
260923  Lighting Control Devices
262200  Low-Voltage Transformers
262416  Panelboards
262726  Wiring Devices
262813  Fuses
262816  Enclosed Switches and Circuit Breakers
262913  Enclosed Controllers
265100  Interior Lighting

Division 27 - Communications
271100  Telephone System
271500  Structured Data Cabling Plants

Division 28 – Electronic Safety And Security
280500  Common Work Results for Electronic Safety And Security
283100  Fire Detection and Alarm

Division 31 – Earthwork - NA
Division 32 – Exterior Improvements - NA
Division 33 – Utilities – NA

END OF CONTENTS
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies concrete work, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Concrete work includes the following:
   1. Foundations.
   2. Slabs on grade with vapor barrier.
   3. Miscellaneous infill.
   4. Lined waste pit for concrete waste.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 017329 – Cutting and Patching.
   2. Section 042000 – Unit Masonry for concrete masonry units.
   3. Section 096723 – Resinous Flooring.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

   1. Product data for proprietary materials and items, including reinforcement and forming accessories including form boards, sealers, admixtures and additives, patching compounds, joint systems, curing compounds, and others if requested by Architect.
   2. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing
bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

B. Concrete mix designs for each concrete mixture and strength.

C. Laboratory test reports for concrete materials and mix design tests.

D. QUALITY ASSURANCE

Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318, "Building Code Requirements for Reinforced Concrete."

1.4 Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Equal of Nox-Crete Form Coating.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

D. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II. Use one brand of cement throughout Project unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type F.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete. Sand shall be clean manufactured or natural sand.

D. Water: Potable.

E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

F. Water-Reducing Admixture: ASTM C 494, Type A.

G. Interior Concrete Floor Sealer: High solids content, penetrating, transparent, VOC-compliant, low-luster acrylic resin sealer, equal of WR Meadows VOCOMP-25.

2.4 RELATED MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. Polyethylene-coated burlap.

C. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss
not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal. V.O.C. compliant.

D. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

E. A vapor-impermeable barrier shall be provided beneath structural slabs on grade.

Permeance after mandatory conditioning: Less than 0.01 Perms
ASTM E 1745 Section 7.1, Subparagraphs 7.1.2-.5
Strength: ASTM E 1745 Class A
Thickness: 15 mils minimum
Product: Stego Wrap Vapor Barrier with accessories (Stego Tape, Stego Mastic)

Other Products:
   Reef VaporGuard
   Poly-America Vapor Guard

2.5 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

1. Do not use the same testing agency for Field quality control testing.
2. Limit use of fly ash to not exceed 15 percent of cement content by weight.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect.

C. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Slabs, and sloping surfaces: Not more than 3 inches.
2. Reinforced foundation systems: Not less than 3 inches and not more than 5 inches.
3. Other concrete: Not more than 4 +/- 1" inches.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by
Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

E. Proportion concrete mixtures as follows:

1. 3000 psi Concrete: 480 lbs. minimum cement per cubic yard.

2.6 ADMIXTURES

A. Use water-reducing admixture in pumped concrete as needed to enhance placement and workability.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL: Coordinate the installation of joint materials and other related materials with placement of forms and reinforcing steel.

3.2 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute’s recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement to top or bottom of slab. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as shown on shop drawings and reviewed by the Structural Engineer.
D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions. Lap joints 6 inches and seal with associated tape.

B. Tape all around penetrations and at terminations.

3.4 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure and in a regular and symmetrical arrangement as much as possible, as acceptable to Architect.

B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

C. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.

1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

   a. If joint pattern is not shown, provide joints not exceeding 12 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
   
   b. Joint fillers and sealants are specified in Section 079200 - Joint Sealants.

3.5 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
3.6 FORMS

A. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

B. Forms for Cast-In-Place Items: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position as shown in final shop drawings.

   1. Provide Class A tolerances for all exposed formed concrete surfaces.
   2. Provide Class B tolerances for non-exposed concrete surfaces.

C. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide rubber or wood chamfer strips at all vertical and horizontal corners. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

E. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces after each use. Remove chips, wood, sawdust, dirt, or other debris, and coat with form-release in accordance with manufacturer's instructions; do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
1. Retighten forms and bracing before placing concrete, as needed to prevent mortar leaks and maintain proper alignment. Take extreme care at horizontal changes in directions, and undersides of flat horizontal surfaces, to prevent form leaks.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.


C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309. Keep a spare vibrator at the site whenever placing concrete.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

1. Do not use frozen material.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.8 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified.

1. After screeding, consolidating, and leveling concrete slabs, do not work
surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units.

Typical Surfaces: Finish surfaces to tolerance of 1/4" in 10 ft. measured using a 10 ft. straightedge consistently across the slab.

Cut down high spots and fill low spots. Uniformly and positively slope surfaces to drains as shown. Immediately after shaping surfaces or leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view in the finished work and to those to receive a broom finish.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerance of 1/4" in 10 ft. measured using a 10 ft. straightedge at several points on the slab. Grind smooth any surface defects that would telegraph through applied floor covering system.

2. Resinous Flooring: Apply light trowel finish.

C. Broom Finish: Apply medium broom finish at all exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

D. Scratch Finish: Provide a light scratch finish at all interior surfaces to receive finish flooring – tile.

3.9 FINISHING FORMED SURFACES

A. Cast-In-Place Concrete: Remove forms after adequate set-up and curing period so that concrete will not be damaged by removal of forms. Remove all fins back to base surface of concrete. Clean-out and regularize edges of form-tie holes and provide reveal-type gray-cement-compound snap-plugs permanently adhered/sealed into holes as far back from face of concrete as possible.

B. Related Unformed Surfaces: Strike-off smooth and finish with smooth texture to closely match that of formed surfaces.
3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods

1. Interior Concrete to Receive Finishes: Provide moisture or moisture-retaining cover curing by the following methods:

   a. Keep concrete surface continuously wet by covering with water.
   b. Use continuous water-fog spray.
   c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
   d. Provide moisture-retaining cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3.12 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose
reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

D. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

E. Repair methods not specified above may be used, subject to acceptance of Architect.

3.13 INTERIOR CONCRETE FLOOR SEALING: Apply sealer/hardener to exposed flooring at scheduled locations following manufacturer’s directions. Brush away excess sealer prior to set.

3.14 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Owner will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

   a. Slump: ASTM C 143; one test at point of discharge for each day’s pour of each type of concrete; additional tests when concrete consistency seems to have changed.

   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day’s pour of each type of air-entrained concrete.

   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below, when 80 deg F and above, and one test for each set of compressive-strength specimens.

   d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

   e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd.
more than the first 25 cu. yd. of each concrete class placed in any one day; two specimens tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

3. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.

4. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

5. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Test results will be reported in writing to Architect, Structural Engineer, Owner, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 033000
SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Concrete unit masonry and mortar

B. Section 055000 – Metal Fabrications for supplementary supports.

C. Joint sealers are specified in Section 079200.

D. Section 099000 – Painting.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):

1. Concrete unit masonry: Minimum f'm = 1500 psi.

1.4 SUBMITTALS

A. Product data for each different masonry unit, accessory, and other manufactured product specified.

B. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
C. Material test reports from a qualified independent testing laboratory employed and paid for by Owner indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.
2. Grout mixes. Include description of type and proportions of grout ingredients.
3. Masonry units.

1.5 QUALITY ASSURANCE


1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

B. Store cementitious materials off the ground, under cover, and in dry location. Store aggregates where grading and other required characteristics can be maintained and contamination avoided. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

B. Protect base of walls and adjacent surfaces from mortar splatter by means of coverings spread on ground and over wall surface.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form
1. Provide special shapes where indicated and as follows:
   a. Standard square-edged units.

2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
   a. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
   b. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N and as follows:
      a. Unit Compressive Strength: Provide units with minimum average net area compressive strength indicated below:
         a. 1900 psi.
         b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.
         c. Weight Classification: Normal weight.
         d. Sizes: 8”x6”x16”, unless shown otherwise.

3. Type I, moisture controlled units, cured to comply with ASTM C 90 Type 1. Limit linear shrinkage from 0.03% to 0.045% at a moisture absorption of 30% during delivery and until time of installation.

4. Faces:
   Interior: Plain gray concrete block to be painted.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type II, except Type III may be used for cold-weather construction. Provide natural color cement as required to produce required mortar color.

2. Hydrated Lime: ASTM C 207, Type S.

3. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.


5. Water: Clean and potable.


B. Fly Ash: Allowed.

2.3 REINFORCING STEEL

A. Steel Reinforcing Bars: Material and grade as follows:

1. Billet steel complying with ASTM A 615, Grade 60.

2. Deformed Reinforcing Wire: ASTM A 496.


B. JOINT REINFORCEMENT

1. General: Provide joint reinforcement complying with the following:
   b. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
   c. Wire Diameter for Side and Cross Rods: 0.1483 inch (9 gage).
   d. For single-wythe masonry provide type as follows with single pair of side rods:
1. Ladder design with perpendicular cross rods spaced not more than 16 inches o.c.

2. MISCELLANEOUS ANCHORS
   a. Unit Type Masonry Inserts in Concrete: Cast iron or malleable iron inserts of type and size indicated.
   b. Anchor Bolts: Steel bolts complying with A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
      c. Headed bolts.
      d. Nonheaded bolts, bent in manner indicated.

3. POSTINSTALLED ANCHORS
   a. Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.
   b. For postinstalled anchors in grouted concrete masonry units: Capability to sustain, without failure, a load equal to 6 times loads imposed by masonry.

2.4 MISCELLANEOUS MASONRY ACCESSORIES

   A. Compressible Filler Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:
      1. Neoprene.
      2. Preformed Control Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

2.5 MASONRY CLEANER

A. Plain Block: Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.6 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

B. Do not use calcium chloride in mortar or grout.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. Limit cementitious materials in mortar to Portland cement-lime.

2. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated. The use of fly ash in grout will not be allowed. Use grout with minimum compressive strength of 2000 psi at 28 days, proportioned per Table 1 of ASTM C 476, delete reference to mix proportion per compressive strength in paragraph 5.2 of ASTM C 476.

3. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.

4. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

1. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4" in 10', or 3/8" in 20', or 1/2" in 40'. For external corners, expansion joints, control joints, or other conspicuous lines, do not exceed 1/4" in 20', or 1/2" in 40'. For vertical alignment of head joints, do not exceed plus or minus 1/4" in 10', or 1/2" maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4" in 20', or 1/2" in 40' or more. For top surface of bearing walls, do not exceed 1/8" in 10', nor 1/16" within a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portions of columns, walls, and partitions, do not exceed 1/2" in 20' or 3/4" in 40' or more.

D. Variation in Cross Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed -1/4" or +1/2".

E. Variation in Mortar Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8" with a maximum thickness limited to 1/2". Do not vary bed joint thickness from bed-joint thickness of adjacent course by more than 1/8". Do not vary from bed-joint or head-joint thickness indicated by more than plus or minus 1/8". Do not vary from collar-joint thickness indicated by more than minus 1/4" or plus 3/8".
3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and mortar prior to laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

   a. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

3. Maintain consistent mortar joint width, typically 3/8”. Tool exposed joints consistently dense and slightly concave. Where joints will be covered with other materials (such as tile, furring), strike flush and smooth with face of block.
3.6 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16" o.c. for typical walls. Space not more than 8" o.c. in foundation walls and parapet walls.

2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12" beyond opening.
   a. Reinforcement above is in addition to continuous reinforcement.

3. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

4. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

1. Form control joints in concrete masonry as follows:
   a. Fit bond breaker strips into hollow contour in ends of block units on one side of control joint. Fill the resultant core with grout and rake joints in exposed faces.
   b. Install preformed control joint gaskets designed to fit standard sash block.
   c. Install special shapes designed for control joints. Install bond breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
2. Install temporary filler in head joints and remove when unit masonry is complete.

3.8 INSTALLATION OF REINFORCED UNIT MASONRY

A. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.

B. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

D. GROUTING

1. Provide minimum clear dimensions of 2" and clear areas of 8 sq. in. in vertical cores to be grouted.

2. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 5'.

3. Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height, stop pour at course below bond beam.

4. Pour grout using chute or container with spout. Mechanically vibrate grout during placing. Place grout continuously, do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.

5. Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

E. Placing Reinforcement:

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

2. Position reinforcement accurately at spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than nominal bar diameter or 1" (whichever is greater).

3. Splice reinforcement bars where shown; do not splice at other points unless acceptable to Architect. Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
   a. Provide not less than minimum lap indicated, or if not indicated, as required by Code.

3.9 FIELD QUALITY CONTROL
   A. The Owner will employ and pay a qualified independent testing agency to perform the following testing and submit test reports for field quality control.
   B. Sampling and Testing Mortar and Grout:
      1. Mortar and grout samples shall be secured from field mixed materials. Do not use retempered mortar.
      2. Compressive Test Specimens: ASTM C 780 for mortar and UBC standards 24-28 for grout; one set of four molds each for mortar and grout for each compressive strength test. Molding and field and laboratory storage of molds shall be per UBC standard.
      3. Compressive Strength Tests: ASTM C 780 for mortar and ASTM C1019 for grout; one set (four molds) for each material the first day it is used and averaging every third or fourth day that the material is used thereafter, but not less than one set for each 2,000 sf of wall for each material; one specimen for each material tested at seven days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
         a. Strength level of mortar and grout will be considered satisfactory if average sets of three consecutive strength test results equal of exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than
300 psi.

4. Test results will be reported in writing to Architect, Structural Engineer, Owner, and Contractor on same day that tests are made. Reports of compressive strength tests will contain the project identification name and number, date of material placement, name of testing service, location of material in structure, design compressive strength at 28 days, material mix proportions and materials; compressive breaking strength for both seven day and 28 day tests.

5. If testing service reports and inspections indicated specified materials strengths and other characteristics have not been attained in the structure, the testing service will make additional tests of in-place mortar or grout, as directed by the Architect. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable material is verified.

   a. Complete cost of retesting and/or reinspecion shall be the Contractor's responsibility. Retesting and reinspection shall be performed by the Owner's testing and inspection service.

3.10 REPAIRING, POINTING AND CLEANING

   A. At any exposed work, remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

   B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Fill all small cracks and beeholes. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

   C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

   D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

      1. Remove large mortar particles by hand with wooden paddles and nonmetallic scarp hoes or chisels.
2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

   a. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

   b. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly and completely by rinsing thoroughly with clear water.

   c. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 45 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time to apply water repellent coating.

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Excess masonry materials are Contractor's property. On an ongoing basis, remove all excess materials, waste and debris from Project site and legally dispose of.
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Miscellaneous framing.

B. Related Sections include the following:
   1. Section 033000 - Cast-in-Place Concrete for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
   2. Section 061000 – Rough Carpentry.
   3. Section 064023 – Architectural Woodwork for lavatory counters.
   4. Section 099000 - Painting.

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   2. Provide templates for anchors and bolts specified for installation under other Sections.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."
1.5  PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Provide allowance for trimming and fitting at site.

1.6  COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1  METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2  FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
D. Iron Castings: Gray iron, Class 35-B, or better, for heavy duty use.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

C. Eyebolts: ASTM A 489.

D. Machine Screws: ASME B18.6.3.

E. Lag Bolts: ASME B18.2.1.

F. Wood Screws: Flat head, ASME B18.6.1.


I. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

J. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.


2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).


2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and
supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.8 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Interiors (Damp Locations): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Coat iron that will be in contact with fresh concrete as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of
exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers’ written instructions and requirements indicated on Shop Drawings.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055000
SECTION 055213 – ALUMINUM HANDRAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Aluminum tube handrailings to match existing at ramped area of Corridor.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer’s product lines of mechanically connected railings.
   2. Railing brackets.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.
C. Drawn Seamless Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.

Existing Railing to Match

2.3 FASTENERS

A. General: Provide the following:
   1. Aluminum Railings: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.

2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections.

H. Welded Connections: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
1. By bending or by inserting prefabricated elbow fittings.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
2.7 ALUMINUM FINISHES

A. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).

B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3.5 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Dimensional wood framing and supports, backing boards, grounds, nailers, blocking and hardware.

1.3 DEFINITIONS: Rough carpentry includes carpentry work not specified as part of other Sections.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

C. Wood treatment data as follows including chemical treatment manufacturer’s instructions for handling, storing, installation, and finishing of treated material:

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 material complies with specified standard and other requirements.

3. Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
4. Warranty of chemical treatment manufacturer for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

   1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:

   1. WCLIB - West Coast Lumber Inspection Bureau.
   2. WWPA - Western Wood Products Association.

C. 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.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

   1. Provide dressed lumber, S4S, unless otherwise indicated.
   2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

E. Dimension Lumber: Provide Douglas-fir-larch lumber with grade and allowable stresses as indicated on the structural drawings.
2.2 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction including bucks, nailers, blocking, 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: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.4 CONSTRUCTION PANELS, GENERAL

A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.5 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. Construction Panels for Backing:

1. Plywood Backing Panels: For mounting electrical or communications equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXTERIOR, not less than 15/32 inch, unless otherwise indicated.
2. Paint all backing panels same as adjacent walls. Provide fire resistant paint system as specified in Section 099000 – Painting.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Fasteners used in exterior applications shall be non-corrosive.


D. Wood Screws: ANSI B18.6.1. Provide flat washers at all attachments of panels.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.7 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.

2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

2.8 PRESERVATIVE TREATMENT: Where lumber of plywood is indicated as "Treated," or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB Quality Mark Requirements.

1. Typical at all locations within 18 inches of concrete floor slabs.
2. In connection with roofing, including curbs, perimeter nailers, blocking, crickets, etc.

2.9 FIRE-RETARDANT TREATMENT BY PRESSURE PROCESS

A. General: Where fire-retardant-treated wood is required by an assembly, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20.

1. Interior Type A: For interior locations, including backing boards in electrical and telephone rooms, and all blocking and supplementary supports within interior partitions.

2. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1. INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated. All nailing shall be according to Table 2304.9.1 of the International Building Code.

C. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

2. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

Use inorganic boron for items that are continuously protected from liquid water. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.


J. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

1. 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.

2. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

3. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS AND BLOCKING

A. Install wood grounds, nailers and blocking where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location
with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Where possible, anchor to formwork before concrete placement.

3.3 INSTALLATION OF CONSTRUCTION PANELS


3.4 Fastening Methods: Fasten construction panels as shown on structural and as indicated below:

1. Plywood Backing and Wall Panels: Screw to supports.

END OF SECTION 061000
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Quartz surface lavatory countertops with support brackets.
3. Composite wood slats and support brackets for changing benches.

B. Section 099000 – Painting for painting underside of countertop substrate and counter support brackets.

1.3 SUBMITTALS

A. Shop Drawings: Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Indicate finishes for each surface.

B. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

C. Submit samples of solid surfacing material.

D. Submit samples of composite wood slats.
1.4 QUALITY ASSURANCE

A. Quality Standard: Comply with applicable requirements of "Architectural Woodwork Standards" Edition 1, published by the Architectural Woodwork Institute (AWI) and the Woodwork Institute, except as otherwise indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. Areas shall be conditioned to temperature and humidity at which they will remain in the finished work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Plywood and Lumber: PS 1. Provide CDX for support of countertops.


3. Quartz Aggregate Surfacing: Natural quartz surfacing material. Edges shall be eased.

   Gloss – 45% (glossmeter)
   Density – 2.4 gm/cm sq (hydrostatic scale
   Moisture Absorption – 0.02% (ASTM C-97)
   Modulus of Rupture – 6,800 psi (ASTM C99)
   Compressive Strength – 24,750 psi (ASTM C-170)
Abrasion Resistance – 223 (ASTM C501)
Thickness – 1 cm (.4”) thickness

a. BASIS OF DESIGN: MSI International Premium Natural Quartz – Limestone Look – Shadow Gray (to match existing)


a. Color as selected.

2.2 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

F. Bench Slats: Configure as shown on drawings. Round/Ease all edges – long sides and all cuts and ends.
2.3 HARDWARE AND ACCESSORY MATERIALS

A. Counter and Shower Seat Brackets: Fabricated steel “T” shapes, leg for attachment to wall and projecting support leg. 450 lb. support capacity. Primed for painting. Equal Rakks EH Series, EH 1818 with 18” legs.

   a. Recommended Anchorage: ¼” x 2” Philips pan head screws or heavy duty toggle bolts.

   b. GC coordinate for adequate wall support.

B. COUNTERTOPS: Quality Standard: Comply with AWI Section 400 for fabrication requirements for plastic laminate covered countertops.

   1. Quartz Surface: All solid surface countertops and trim shall be fully supported full width x depth.

      a. Joints: Joints and edges in material shall be prepared smooth and joints in finished products shall be invisible.

      b. Cutting and Shaping: Use appropriate saws and grinding to cut to shapes as shown on drawings, with all lines smooth and radiused cleanly. Ease exposed edges after cutting.

      c. Edge: Provide full bullnose.

2.5 FASTENERS AND ANCHORS

A. Screws and Nails: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 and FS FF-S-105, respectively, for applicable requirements.

B. Anchors: Select material, type, size, and finish required by 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 bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.
PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing (do not move to site or install until permanent HVAC distribution is in place and is operational).

B. Coordinate to ensure that proper blocking or other supports is provided for all wall attached casework.

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

B. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

D. Tops: Anchor securely to counter brackets as indicated, scribe and fit carefully to surrounding walls. Seal all around at all wall junctures with a clean bead of clear elastomeric sealant.

F. Complete the finishing work to whatever extent not completed at shop or before installation of woodwork.
3.3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Cover countertops with kraft paper if subject to damage during completion of construction work. Clean woodwork on exposed and semiexposed surfaces at time of completion of project. Touch up factory-applied finishes to restore damaged or soiled areas.
SECTION 079200 - JOINT SEALERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

C. Work may include, but is not limited to:
   - sealant at toilet accessories
   - sealant at HM door and window frames
   - control joints in masonry
   - sealant along back splashes at countertops to walls
   - sealant at aluminum doors and frames

1.02 RELATED SECTIONS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 084413 – Aluminum Framing and Doors

C. Section 092900 – Gypsum Drywall Systems.

D. Section 099000 - Painting.

E. Section 102800 - Toilet and Bath Accessories.

1.03 REFERENCES

A. ASTM C804 - Use of Solvent-Release Type Sealants.

B. ASTM C919 - Use of Sealants in Acoustical Applications.

C. ASTM C920 - Elastomeric Joint Sealants.

D. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

F. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color, and adjacent surfaces to be caulked.

B. Samples: Submit 2 samples illustrating full range of sealant colors for selection.

C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Applicator: Company specializing in performing the work of this section with minimum five years experience.

1.07 ENVIRONMENTAL REQUIREMENTS: Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 COORDINATION: Coordinate the work with all sections referencing this section.
1.9 WARRANTY

A. Provide five year warranty under provisions of Div. 1.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.01 SEALANT MATERIALS

A. VOC Content of Interior Sealants and Sealant Primers: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: Not more than 250 g/L.
2. Sealant Primers for Non-porous Substrates: Not more than 250 g/l.
3. Sealant Primers for Porous Substrates: Not more than 775 g/l.

B. Interior Elastomeric: One-part, non-sag, moisture-cure, high-performance polyurethane sealant:

Product: Equal of BASF Sonolastic NP 1 ASTM C 920, Type S, Grade NS, Class 35, Use NT, M A, and I.

Performance Requirements:
1. Durometer Hardness, ASTM C-661, Shore A: 25-30
2. Ultimate Tensile Strength, ASTM D-412: 350 psi
3. Ultimate Elongation, ASTM D-412: 800 percent elongation
4. Movement Capability, ASTM C-719: +/-35% sustained through weathering
5. Peel Strength, ASTM C-794: 30 pli
6. Staining, ASTM C-1248: Passes with no staining indicated for granite, limestone, brick or concrete


2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056 D1565; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer’s instructions.

C. Perform preparation in accordance with manufacturer’s instructions.

D. Protect elements surrounding the work of this section from damage or disfiguration.
3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Install sealant to be straight and non-waving in joints.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave, dense and consistent.

3.3 CLEANING

A. Clean adjacent soiled surfaces and remove all sealant from adjacent surfaces.

3.4 PROTECTION OF FINISHED WORK: Protect sealants until cured.

END OF SECTION
SECTION 081113 - STEEL (HOLLOW METAL) DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors: Steel doors.

2. Frames: Hollow metal frames of following type for doors, sidelights, borrowed lights, windows, and other interior and exterior openings:

   a. Welded unit type.

3. Provide factory primed doors and frames to be field painted.

B. Joint sealers are specified in Section 079200.

C. Door hardware is specified in Section 087100.

D. Glazing is specified in Section 088000.

1.3 SUBMITTALS

A. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.
B. Shop drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE: Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

1. Doors and Frames: Provide with metallic coating conforming to ASTM A924 for hot dip galvanization.
C. Supports and Anchors: Fabricate of not less than 18-gage sheet steel. For anchorage to steel stud partitions provide anchors welded to frame.

D. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

E. Shop Applied Paint: Apply after fabrication.
   1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.2 DOORS

A. Provide metal doors of SDI grades and models specified below:

1. ANSI/SDI-100
   a. Interior Doors: Grade II, heavy duty, minimum 18 ga. steel faces, seamless faces with edges seams welded and ground. Infill of resin-impregnated honeycomb.
   b. Reinforce vertical edges with minimum 16 ga. x 1.75" channels with 1" returns.
      1) Glass stops shall be 20 ga. steel channels, factory installed and through-fastened with countersunk flathead machine screws.
   c. Provide inverted bottom closure channel.
   d. Lock and hinge stiles shall be accurately mortised and reinforced to receive scheduled hardware. Reinforcement shall be not less than 3/16" thick steel drilled and tapped to receive hinges and locks. From the top edge of all doors and located 3" from the top, install a 16" x 14 ga. channel to separate the faces of the door, and two reinforcing plates 22" x 4.5" x 12 ga. to suit closers. Install spreaders for panic hardware which requires through-bolts. Reinforce for push plates, escutcheons, and similar items with 14 ga. sheet.
2.3 FRAMES

A. Provide metal frames for steel doors, sidelights, borrowed lights, interior windows, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.

1. Fabricate frames with mitered or coped corners, welded construction for all applications.

2. Form all interior door frames from 16-gage steel, except 14 ga. at pairs.

3. Provide 4 wall anchors per jamb, plus a floor anchor, with mortar boxes for all hardware, 16 ga.

4. All rabbets shall be sized, and hinge preparations performed to accommodate seals and gaskets to allow doors to close properly.

B. Door Silencers: Drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

2.4 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Clearances: Not more than 1/4 inch at jambs and heads; 3/4” at sill to allow for ½” threshold and door shoe.

B. Fabricate exposed faces of doors and panels from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.
E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.

G. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

H. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

I. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units.
   
   1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
   2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

   1) In metal-stud partitions and existing walls, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.

   2) Masonry Walls: Coordinate installation of frames to anchor into masonry as it goes up and to allow for solidly filling space between frames and masonry with grout.
3) Non-Fire-Rated Steel Doors:
   a) Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b) Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
   c) At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
   d) Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

C. Glazing: Comply with installation requirements in Section 088000 - Glazing and with hollow-metal manufacturer's written instructions.
   1) Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.2 ADJUST AND CLEAN

   A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

   B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 081113
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Extent and location of each flush wood door is indicated on drawings and in schedules.

B. Type of doors required is the following:

1. Solid core flush wood doors with wood veneer faces.

C. Shop-priming, factory-finishing, and factory-premachining for hardware for wood doors are included in this section.

D. Hollow metal frames are specified in Section 081113.

E. Door hardware is specified in Section 087100.

1.3 SUBMITTALS:

A. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:


B. NWWMA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.

1. For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING: Protect doors with plastic bags during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer’s instructions.

1.6 PROJECT CONDITIONS: Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:

1.7 FIRE-RATED WOOD DOORS: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1.8 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
B. Door Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective solid core interior doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, delamination, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include reinstallation and refinishing which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

2. Warranty shall be in effect during following period of time after date of Substantial Completion: Lifetime of installation.

PART 2 - PRODUCTS

2.1 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors for Transparent Finish: Comply with the following requirements:

2. AWI Grade: A
3. Construction: PC-5 (Particleboard core, 5-ply faces), with stiles and rails glued to core and sanded before laminating, and all doors assembled with Type I adhesive. Provide solid wood blocking for closers, exit devices, and locksets. Stiles and rails shall be of solid hardwood, 1-1/8" minimum for rails, 1-3/8" minimum for stiles. Surrounds for light openings shall be compatible hardwood, 6" minimum on all sides.
2.2 FABRICATION:

A. Fabricate flush wood doors to produce doors complying with following requirements:

1. In sizes indicated for job-site fitting.
2. Doors shall be machined for hardware at the site.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

2.3 FACTORY FINISHING:

A. General: Comply with referenced AWS quality standard including Section 5 - Finishing to prefinish wood doors at factory.

B. Finish: Comply with requirements indicated for grade, finish system, staining effect and sheen. Finish all surfaces of doors. Reseal all surfaces cut or trimmed after finishing doors.

1. AWS Grade: Custom.
2. Factory finish doors in accordance with WDMA I.S.1A or AWS Quality Standards. Factory finish to be water based stain with ultraviolet (UV) cured polyurethane sealer. Finish must meet or exceed performance standards of UV cured polyurethane (TR-6) or (System 9).
3. Staining: None – transparent to match existing at Women’s Lockers
4. Effect: Open grain finish.
3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Hardware: Coordinate with Section 087100 - Finish Hardware.

B. Manufacturer's Instructions: Install wood doors in HM frames to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal all cut surfaces after fitting and machining (including cutouts, edges, tops and bottoms of doors).

1. Fitting Clearances for Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of floor finish. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

2. Bevel doors 1/8" in 2" at lock and hinge edges.

D. Factory Finished Doors: Restore finish before installation as required. The Owner will not accept doors which show signs of repair. Seal all edges or penetrations cut after finishing or in the field.
3.3 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by manufacturer to ensure that they will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 081416
PART 1 - GENERAL

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

1.2 DESCRIPTION OF WORK: Furnish all Finish Hardware and related items to complete work shown and specified. See drawings, schedules and details for items requiring hardware and for installation details.

A. Hollow metal doors are specified in Section 081113.

1.3 WORK EXCLUDED: Items generally known as rough hardware, or items of Finish Hardware when noted elsewhere in the Specifications as being furnished or included with items by other suppliers or Contractors, are not included.

A. Owner will provide cylinders and final keying for all locksets. General Contractor shall provide his own lockset cylinders and keys during construction as needed for project security.

1.4 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's immediate vicinity for a period of not less than 2 years, and who is, or employs on a full time basis, a registered Architectural Hardware Consultant member of the Door and Hardware Institute to properly detail work, order materials, and supervise installation.

1. The firm proposing to supply Finish Hardware for this project must be a regular stocking distributor of the hardware it proposes to furnish.

2. The Hardware Supplier shall make periodic inspections of project (upon receipt of hardware at project, during installation and at completion of installation) so that at the completed installation,
Supplier can certify that said hardware is properly installed according to manufacturer's printed instructions. Forward copy of certification from Hardware Supplier in duplicate to Architect as soon as possible after installation of all hardware.

C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

A. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.5 GENERAL REQUIREMENTS: Confirm appropriateness of all hardware and provide hardware that installs without conflict with other hardware and is compatible in size and configuration for installation in the doors and frames as detailed and specified. Supply all template information necessary for installation to the Contractor and hardware installer. Furnish hardware to match templates provided.

A. Supply templates to door and frame manufacturers, as required to enable proper and accurate sizing and locations of cutouts for hardware.

B. Items of hardware not specified but required for completion of the work shall be furnished of type and quality suitable to the service required and comparable to adjacent hardware at no additional cost to the Owner.

1.6 SUBMITTALS:

A. Product Data: Submit manufacturers' technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation, instructions for maintenance of operating units and, finish, and other pertinent data.

B. Hardware Schedule: Prior to delivery of hardware, the Finish Hardware supplier shall prepare and submit complete schedules of all Finish Hardware required. Hardware sets on schedule shall be designated in the same manner as on the hardware schedule at the end of this section.
1. Based on builders hardware indicated, organize hardware schedule into hardware sets, in a vertical format, indicating complete designations of every item required for each door opening. Include the following information:

   Type, style, function and finish of each hardware item.

   Name and manufacturer of each item and representative catalog cuts for each item.

   Manufacturer’s complete catalog number.
   Fastenings and other pertinent information.

   Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.

   Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

   Mounting locations for hardware.

   Door and frame sizes and materials.

C. Operation and Maintenance: Provide Owner with manufacturer’s parts list and maintenance instructions for each type of hardware supplied, include necessary wrenches and tools required for proper maintenance and adjustment of hardware, all as supplied with hardware when shipped to Contractor.

D. Certification: Inspect the installation of all hardware and related items. At the completion of installation, submit certification that material is properly installed, according to manufacturer’s printed instructions.

E. Guarantee: Provide written guarantee for all hardware against defects in materials and workmanship for one year. Repair, replace, or otherwise correct deficient materials at no additional cost to the Owner.
1.7 DELIVERY, STORAGE AND HANDLING:

A. Package each item of hardware and each lock separately in individual containers, complete with necessary screws, keys, instructions and installation templates for spotting mortising tools. Mark each container with heading number and number corresponding to numbers shown on Finish Hardware schedule.

B. Inventory hardware jointly with representative of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. The hardware shall be fitted prior to finishing doors, as applicable, and then removed and finishing completed before final installation of hardware.

D. The Contractor shall prepare a suitable storage space for all Finish Hardware and shall keep it under lock after it has been delivered to the building. He shall take full responsibility for all items of hardware after delivery. Install all hardware without marring or damaging hardware or other work. Replace all marred or damaged work. Adjust hardware for easy operation.

1.8 COORDINATION AND QUALITY OF WORKMANSHIP: Install closers, stops and other hardware as scheduled. Contractor shall coordinate for provision of extra support blocking for all interior and exterior applied hardware as needed for secure installation.

A. All hardware shall be installed by workmen skilled in this type of work, and the installation of the hardware shall in no manner detract from the appearance of the doors. Faulty workmanship shall be cause for rejecting the doors. Where manufacturers specify certain requirements in installing doors, these requirements shall be called to the attention of the workmen, and they shall be followed.

PART 2 - MATERIALS

2.1 HAND OF DOOR: The drawings show the direction of swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown. Notify the Architect of discrepancies.
2.2 BASE METALS: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FG-G-111, FS FF-H-116, and FS FF-H-121. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

2.3 FASTENERS: Furnish finish hardware with all necessary screws, bolts, or other fastenings of suitable size and type to anchor the hardware in position for heavy use and long life and of compatible material and finish. Furnish fastenings with anchors according to material to which it is applied, and as recommended by the manufacturer. Fasten closers on wood or mineral core doors with sex nuts and through bolts.

A. Manufacture hardware to conform to the published templates and prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

B. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners.

2.4 KEYING: All new locksets shall be provided less cylinders. Owner will key and install cylinders at the completion of the project.

A. Construction cylinders: The Contractor shall provide suitable construction cylinders for use to secure the work. At time of completion the Contractor shall remove construction cylinders to allow installation of Owner-supplied permanent cylinders.

2.5 FINISH: Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's
standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

A. Provide finishes which match those established by the BHMA.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standard, but in no case less than specified for the applicable units of hardware by referenced standards.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in "Materials and Finishes Standard 1301" by the BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. Typical Finish: US26D (626); flatwork and accessories provided in stainless steel (32D) or another finish to match.

2.6 ACCEPTABLE MANUFACTURERS: Acceptable manufacturers for particular items of hardware are listed below.

A. Butts: Hager, McKinney, Stanley
B. Locksets, Passage Sets and Privacy Sets: Arrow, Schlage, Sargent
C. Push/Pull Plates, Kickplates, Armorplates: BBW, Quality, Trimco
D. Stops and Bumpers: BBW, Quality, Trimco
E. Exit Devices, Removable Mullions: Von Duprin (no substitution)
F. Seals and Trim: Pemko, National, Zero
G. Closers: LCN

2.7 HINGES: Provide all hinges, ball-bearing type, standard weight for interior doors; with non-rising pins; provide flush button top and bottom tips on reverse bevel doors. Provide heavy weight hinges, with non-removable pins for exterior doors.

A. Width: Determine correct clearances and provide butt width as required for proper operation. Typically 4-1/2".
Length: 4-1/2" for doors to 36" wide, 5" for wider (there are 42" doors).

Number required: 3 butts for doors over 60" high to 90" high

2.8 LOCKSETS AND PASSAGE SETS:

A. All locksets, passage sets and privacy sets shall be Q series (Grade 1), with lever handle, Arrow "Sierra" trim (SR), furnished without cylinder. Functions as scheduled. Lever sets shall be provided with vandal-resistant freeswinging levers – Q Series “Overdrive”. Equal by Schlage or Sargent.

B. All strikes shall be full size and furnished with curved lips.

C. All locksets and deadbolts shall be 2-3/4" backset.

2.9 STOPS AND BUMPERS: Provide wall type where conditions permit, otherwise provide floor type. Preferred floor type for interior work, if wall type is not applicable, is BBW 806 Series as required, or equal.

2.10 KICKPLATES: 10" H x 34" W, .050” brushed stainless steel with beveled edges.

2.11 EXIT DEVICES:

At Aluminum Doors: Von Duprin 33A Slimline Series, rim type, ANSI A156.1-2001 Grade 1. Provide dogging on non-fire-rated exits. Typical trim ANSI Function 08, locking/unlocking lever, unless noted otherwise.

2.12 GASKETS AND WEATHERSTRIPPING: At smoke control and exterior doors, provide metal retainer elastomeric gasket complying with Smoke, Air Leakage: Comply with NFPA 105. Equal of Pemko 294_V.

2.13 THRESHOLDS: Saddle type, clear anodized finish.

   Interior: Equal Pemko 1665 (5" width).

   Exterior: See Section 084413.


3.1 INSTALLATION:
   
   A. Mount hardware units at heights indicated in "Recommended Locations of Builders Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed.

   B. Install each item of hardware in compliance with the manufacturer’s instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reapplication or reinstallation or application of surface protections with finishing work specified in the Division 9 sections. Do not install surface mounted items until finishes have been completed on the substrate.

   C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

   D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards. Set thresholds in mastic using suitable manufacturer-supplied expansion anchors.

3.2 ADJUST AND CLEAN: Adjust and check each operating item of hardware and each door, to ensure the proper operation or function of each unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

   A. FINAL ADJUSTMENT: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to final acceptance and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final balancing and operation of heating and ventilating equipment. Instruct Owner’s personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.
3.3 CONTINUED MAINTENANCE SERVICES:

A. The General Contractor shall arrange the following to ensure a complete job:

1. Approximately six months after the acceptance of the hardware in each area, the installer, accompanied by the representative of the lockset distributor, shall return to the project and readjust every item of hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation. Prepare a written report of current and predictable problems in the performance of the hardware.

PART 4 - HARDWARE SCHEDULE

General: While the following hardware sets are intended to cover all doors and establish a type and standard of quality, it shall be the specific duty and responsibility of the finish hardware supplier to examine the plans and specifications and furnish proper hardware for all openings, whether listed or not.

HARDWARE SCHEDULE: For each door provide the following:

Hardware Set 1 – Not used

Hardware Set 2 – Not used

Hardware Set 3
Hinges
Closer
Classroom Deadbolt
Push/pull set
Wall stop
Kickplate
Hardware Set 4 – Not used

Hardware Set 5 – Not used

Hardware Set 6
Hinges
Storeroom Lockset
Wall stop

END OF SECTION
PART 1 - GENERAL

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

B. DESCRIPTION OF WORK:

1. Types of work include:

   Gypsum drywall including screw-type metal support system for interior partitions and ceilings. Sound attenuation blankets for partitions as shown.

   Backing boards for application of other finishes.

   Drywall finishing, including trim, priming and texturing.

   Leveling and texturing at indicated existing walls to match new partition texture.

2. Painting of drywall is specified in Section 099000.

C. QUALITY ASSURANCE:

1. Gypsum Board Standard: Comply with applicable requirements of ANSI/ASTM C 840 for application and finishing of gypsum board, unless otherwise indicated.

2. Steel Framing Standard: Comply with applicable requirements of ASTM C 754 for installation of steel framing for gypsum board.


D. SUBMITTALS:

1. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component.

E. DELIVERY, STORAGE AND HANDLING:

1. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

2. 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. Neatly stack gypsum boards flat and support to prevent sagging.

3. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

F. PROJECT CONDITIONS:

1. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.

2. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

A. METAL SUPPORT MATERIALS:

1. Ceiling Support Materials and Systems:
a) General: Size ceiling support components to comply with ASTM C 754 unless otherwise indicated.

b) Main Runners: Steel channels with rust inhibitive paint finish, hot or cold-rolled.

c) Hanger Wire: ASTM A 641, soft, Class 1 galvanized, 8 ga.

d) Metal Studs for Ceilings and Soffits: 20 ga, depth as indicated.

e) Hanger Anchorage Devices: Screws, clips, bolts, or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3x calculated load supported.

2. Wall/Partition Support Materials:

a) Studs: ASTM C 645. Manufacturers are encouraged to use post-industrial or post-consumer recycled materials in the fabrication of metal framing members; submit statement as specified above.

   Depth of Section: 3-5/8", 6" or as otherwise indicated.

   Thickness: 20 ga. for typical partitions.

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.

c) Partition Bridging: Pre-notched galvanized steel channel system or as shown on drawings.

3. PARTITION MATERIALS:

a) GYPSUM WALLBOARD: ASTM C 36, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.

   Type: Regular or Type X, as needed.

   Thickness: 5/8"
b) TILE BACKING – INTERMITTENTLY WET AREAS (LOCKER ROOMS): Abuse-, water-, mold-, and fire-resistant. Provide at all thinset tile applications, and at all toilets with painted drywall partitions.

Equal USG Fiberock Interior Panel – Aqua Tough
Thickness: 5/8”

c) TILE BACKING – WET AREAS (SHOWERS AT FURRED OUT AREA): Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer’s standard edges.

Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:

CertainTeed Corp.; GlasRoc Tile Backer.
Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

Core: 1/2 inch regular type.

Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

d) CEILINGS: Lightweight, sag-resistant panels.

Equal USG Sheetrock Interior Ceiling Panel Sag-Resistant
Thickness: 1/2”

Note: Contractor may elect to use standard 5/8” drywall.

4. TRIM ACCESSORIES: Provide manufacturer's standard trim accessories, formed of galvanized steel (no plastic), with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, J-trim, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
5. JOINT TREATMENT MATERIALS:

a) General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

b) Joint Tape for Drywall: Perforated paper type.

1) Glass Mat Board: Provide self-adhering 10X10 fiberglass mesh tape.

c) Joint Compound: Provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or vinyl-type powder type for topping, meeting ASTM C 475. Provide type suitable for use at moisture resistant partitions, as required.

1) Glass Mat Board: Joints shall be prefilled (prior to taping) with tile-setting compound.

d) Texturing Compound for walls, soffits, and ceilings: A ready-mixed joint compound/topping compound or USG Ready-Mixed Texture Finish, or equal by Hamilton, Murco.

1) This will also be used for floating of existing walls to receive texture.

Texture: Match existing.

e) Surface Primer: Latex primer for preparation of drywall surface prior to application of texture as acceptable to drywall and texture material manufacturer, low V.O.C.

6. MISCELLANEOUS MATERIALS: Sealants and adhesives shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 23).

a) General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.
b) Gypsum Board Screws: Comply with ASTM C 646. Provide recommended corrosion resistant type for fastening moisture resistant and cement board.

1) Glass Mat and Tile Backer Board: Use special tile backer screws, non-corrosive.

c) Adhesive: Construction adhesive, complying with ASTM C557, VOC-compliant.

d) Sound Attenuation/Insulation Batt: 3-1/2” fiberglass batts, unfaced.

7. ACOUSTICAL SEALANT

a) Acoustical sealant shall be non-skinning, non-hardening, flexible sealant specifically designed for sealing gypsum wallboard. Sealant shall be capable of spanning 1/2-inch wide by 3/8-inch deep gaps. Synthetic rubber based products comply with ASTM Standard D-217 and acrylic latex based products comply with ASTM Standard C-834 and shall be VOC-compliant.

Acceptable Products: Tremco (800-321-7906), USG acoustical sealant, Pecora AC-20 FTR (800-523-6688), or approved equivalent.

PART 3 - EXECUTION

A. PREPARATION FOR METAL SUPPORT SYSTEMS:

1. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that structural anchorage provisions have been installed to receive ceiling hangers.

2. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement as follows:

   a. Where partition and wall framing abuts overhead structure or structural walls:
1) Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

b. See drawings for related requirements.

B. INSTALLATION OF METAL SUPPORT SYSTEMS:


a. Ceiling Support Suspension Systems: Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to studs, clips, rods, channels, or other anchorage devices or fasteners as required or indicated.

b. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

c. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

d. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

e. Space furring members as indicated or recommended in handbook.

f. Stud Ceilings/Soffits: Attach runners to ceilings and sidewalls, spaced as indicated, placing fasteners close to outside flange of runner. On stud walls, space fasteners to engage studs. Provide bracing members in accordance with handbook. Fasten at intervals and using fasteners in accordance with Gypsum Construction Handbook and drawings for a braced soffit.

g. Install auxiliary framing or blocking at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
2. Wall/Partition Support Systems:

a. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures and casework, equipment, services, wall-mounted door stops, heavy trim, grab bars, toilet accessories, furnishings and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook".

b. Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

c. Extend partition stud system as indicated to the structural support and substrate above the ceiling except where partitions are indicated to terminate at suspended ceilings. Cut studs 3/4" short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1) For fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

d. Stud Spacing: Spaces studs for interior partitions 16" o.c., unless otherwise indicated.

e. Bridging: Provide continuous channel bridging at mid-height of typical partitions, and at third points in full-height partitions; as shown on drawings.

f. Frame door openings with double 20 ga. studs to comply with details indicated or if not otherwise indicated, to comply with "Gypsum Construction Handbook". Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for jack studs) at head and secure to jamb studs.
1) Provide 3 studs at all corners.

g. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

h. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

i. Install sound batts in framing at indicated locations. Fit between framing members and trim neatly around penetrations and obstructions. Fill gaps with insulation.

C. GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS:


2. Install wall boards to minimize joints requiring treatment, as well as to minimize end butt joints. Locate exposed end-butt joints as far from center of walls and ceilings as possible.

3. Install ceiling boards in the direction and manner which will minimize the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least 1'-0".

4. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

5. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
6. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

7. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

8. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

9. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage. Cut and fit gypsum board around pipes, ducts, conduits, and structural members projecting below underside of floor/roof decks.

10. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4” space and trim edge with U bead edge trim. Seal joints with acoustical sealant.

11. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

12. ACOUSTICAL SEALANT USAGE   Sound Attenuating Construction: Seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant. Comply with acoustical construction details, and manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceilings and the sealing of all penetrations through partitions.

1) Use acoustical sealant to form an airtight seal at all penetrations and perimeter of sound-rated partitions, floors and ceilings. Comply with ASTM C919. Use backer-rod where gaps to be sealed exceed 3/8-inch.

2) Apply acoustical sealant as a continuous bead along gypsum board face layer at all head and sill conditions of sound-rated partitions and around the perimeter of resilient ceilings.
3) Apply expanding foam sealant where multiple pipes or conduits penetrate sound-rated construction.

4) Apply sanitary sealant around all penetrations in tile-backing board.

D. GYPSUM DRYWALL APPLICATION:

1) Ceilings: Apply ceiling boards prior to installation of wall boards if at all possible.

2) Fastening Methods: Apply single layer gypsum boards to supports with screws.

E. INSTALLATION OF DRYWALL TRIM ACCESSORIES:

1) General: Apply trim as shown and as specified herein. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

2) Install metal corner beads at external corners of drywall work.

3) Install metal edge trim whenever edge of gypsum board would be exposed or semi-exposed. Provide type with face flange to receive joint compound. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

4) Install control joints as follows:

<table>
<thead>
<tr>
<th>Partition - interior</th>
<th>max. 30' o.c.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling - interior</td>
<td>max. 50' o.c.</td>
</tr>
<tr>
<td></td>
<td>max. 30' o.c.</td>
</tr>
<tr>
<td>with perimeter relief</td>
<td></td>
</tr>
<tr>
<td>without perimeter relief</td>
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</tr>
</tbody>
</table>

Installation of control joints will be reviewed and if quantity or placement is not according to specification, work shall be removed and replaced as directed.
F. FINISHING OF DRYWALL:

1) General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for final finish. Prefill open joints and rounded or beveled edges as recommended by manufacturer.

2) Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

3) Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

   a. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.

   b. Level 2 where water-resistant backing board panels form substrates for tile.

   c. Level 4 for all remaining gypsum board surfaces unless otherwise indicated.

1) For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects ready for decoration.

4) Seal and treat joints in tile backing board by embedding joint tape in same mortar as being used for setting tile.

G. APPLICATION OF PRIMER AND TEXTURE FINISH:

1) Primer Application: Mix in accordance with manufacturer's instructions. Apply a full coverage coat with roller or preferably spray gun. Allow to dry before proceeding with texturing application.

2) Finish Application: Mix and apply texture finish to drywall wall, soffits, and ceilings, and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture without starved spots or other evidence of thin application, and free of application patterns.
Final texture application shall be match that selected by Architect from submitted texture samples.

3) Remove any texture droppings or overspray from door frames, windows and other adjoining work.

4) At existing surfaces: Provide leveling coat of texture material, and then a surface texture to match that on adjacent new partitions.

H. PROTECTION OF WORK:

1) Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.
SECTION 093000 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Glazed ceramic wall tile and trim.
2. Ceramic mosaic tile at floors, with trim.
3. Waterproofing surface coating at shower floors.

B. Tile backing board for tiled partitions is specified in Section 092900 - Gypsum Drywall.

1.3 SUBMITTALS

A. General: Submit product data for each type of product specified.

B. Samples of each type and color of tile and grout to be provided for Architects review.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.
1.5 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

   1. New Tile and Trim Units: Furnish 5% maintenance stock of each type and color of tile installed.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile".

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. WALL TILE: White-bodied ceramic wall tile, bright glazed, 6” x 6”, equal DalTile to match existing.

   1. Trim: 6” straight base at tiled walls; surface and corner bullnoses as needed at wall tops and vertical tile ends on walls.

D. CERAMIC MOSAIC TILE: Typically 2” x 2” unglazed porcelain ceramic mosaic tile, cushion edges. DalTile Keystones to match existing.

E. Colors and patterns as shown on the drawings.

F. Transition Trim from Tile to resinous flooring, etc.: Equal Schluter-RENO-RAMP/-K sloped profile with 3-1/2” projection, and integrated anchoring leg for installation under tile surface.

   2. Height: As required to meet porcelain ceramic mosaic tile + grout (nominally 3/8”).

2.2 SETTING MATERIALS:

A. Mortar for Walls and Floors: Single component polymer-modified thin-set mortar, needing only the addition of water in the field. Complies with ANSI A118.4, equal of Mapei Ultraflex 2.
1. Provide hydraulic cement fill as needed for leveling or providing slope at shower.

2.3 GROUTING MATERIALS


1) Colors: As selected.


2.4 WATERPROOFING AND CRACK PREVENTION MEMBRANE: Ready-to-use elastomeric membrane.

ASTM C118.10
Fungus and microorganism resistance – Pass/No Growth
Seam strength – 16 lb/2” width
Breaking strength – 484 psi
Dimensional stability – 0.05%
Waterproofness – Pass
Shear strength – 12 day dry cure – 267 psi
Shear strength – 100 day water immersion – 89 psi

ASTM D 638
% elongation – 21 day dry cure – 562%
% elongation – 7 day dry cure/21 day wet cure – 657%

IAPMP/Uniform Plumbing Code
Waterproofness – Pass
Hydrostatic pressure and alkali resistance – Pass

Product: Equal of Custom Building Products RedGard Waterproofing and Crack Prevention Membrane

2.5 Fiberglass Mesh: 6” alkali-resistant fiberglass mesh, self-adhering.

2.6 MIXING MORTARS AND GROUT: Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials and water; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.
3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Tile Protection: Test tile to determine if it can be stained by grout installation and take measures to protect the tile as needed.

3.2 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.


C. Trim: Set floor trim at transitions prior to laying of tile. Install straight and level. Coordinate with installation of resinous flooring.

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 disrupting pattern or joint alignments.

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.
F. Jointing Pattern: Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Extend wainscots to full tile height. Provide uniform joint widths, nominal width 1/8” for glazed wall tiles and nominal ¼” – 3/8” for floor tiles.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where joints occur in substrate behind tile. Do not saw cut joints after installation of tiles.

3.3 WATERPROOFING MEMBRANE INSTALLATION: Apply waterproofing membrane to level bed (prior to setting bed).

A. Cracks up to 1/8” shall be prefilled with material prior to application.

B. Embed in thin coating of membrane 6” fiberglass mesh at joint all around where backing panels come to ground.

C. Using a ¾” rough roller or a 3/16” x ¼” V-notched trowel precoat all corners and intersections where floors and wall meet, extending 6” up at perimeters and out into field.

D. Place one even continuous coat at bottom with trowel or airless sprayer. Allow to thoroughly dry, inspect for voids or pinholes and apply additional material at those areas. Apply another continuous coat perpendicular to the first. Combined coatings shall be approximately 30-35 mils DFT (60-70 mils wet).

3.4 WALL TILE INSTALLATION METHODS

A. Install wall tile to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:


3.4 FLOOR TILE INSTALLATION METHODS:

A. Install floor tile to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

3.6 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible. Keep traffic off floor for period recommended by manufacturer, or at least 72 hours, whichever is greater.

2. Leave finished installation clean and free of cracked, chipped, broken, loose, and otherwise defective tile work.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Before final inspection, remove protective coverings and clean tile using a neutral cleaner.

D. Sealing: Apply spray sealer to all tile grout joints in accordance with manufacturer’s instructions, after cure of grout joints (minimum 21 days per manufacturer). Clean adjacent tile of sealer residue as work proceeds.

END OF SECTION 093000
SECTION 096723 – RESINOUS FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

   1. Resinous quartz flooring system as shown on the drawings and in schedules.
   2. Work includes self-cove for resinous flooring.

B. Related sections include the following:

   1. Cast-in-Place Concrete, Section 033000. Vapor barrier under slab is specified in this section.

1.3 SYSTEM DESCRIPTION

A. The work shall consist of preparation of the substrate, the furnishing and application of an epoxy based multi roller applied flooring system with colored quartz aggregate and urethane topcoat. The system shall have the color and texture to closely matching existing with a nominal thickness of 1/8 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

B. Cove base to be applied where noted on plans and per manufacturers standard detail as shown.

1.4 SUBMITTALS

A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.

B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.

B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.

C. No requests for substitutions shall be considered that would change the generic type of the specified System.

D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.

E. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. All components of the system shall be delivered to the site in the Manufacturer’s packaging, clearly identified with the product type and batch number.

B. Storage and Protection

1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer’s recommendations and relevant health and safety regulations.

2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.
1.7 PROJECT CONDITIONS

A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall ensure that adequate ventilation is available for the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with epoxy material.

1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
3. Sealers and curing agents should not to be used.
4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. The Owner shall be responsible for the removal of foodstuffs from the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

A. Manufacturer shall warrant that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

B. Manufacturer liability with respect to this warranty is strictly limited to the value of the material purchase.
PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Arizona Polymer Flooring, [www.apfepoxy.com](http://www.apfepoxy.com), 800/562-4921, Armor-Rex CQ 100 Decorative Color Quartz Flooring System.

   Color: Salt and Pepper (to match existing).

B. Manufacturer of Approved System shall be single source and made in the USA.

C. Provide other manufacturers’ for prior review and approval prior to bid.

2.2 FLOORING SYSTEM:

A. Seamless epoxy-quarz flooring shall consist of 100% solids clear Epoxy 400 and 28 mesh color quartz aggregate.

B. Tow-component aliphatic Polyurethane 100 or Polyurethane 501 shall be used as the finish coat for systems requiring a moppable texture.

2.3 SYSTEM DESCRIPTION

A. Flooring system shall be 1/8” total thickness and color and texture to match existing.

B. Finished flooring system shall have the following performance characteristics:

   1. Compressive Strength (ASTM C 579) 9500 psi
   2. Tensile Strength (ASTM C 307) 2500 psi
   3. Flexural Strength (ASTM C 580) 4200 psi
   4. Hardness Shore D (ASTM D 2240) 85
   5. Impact Resistance (ASTM D 2794) Passes 160 inch/pounds
   7. Tabor Abrasion (ASTM D 1044) 34 mg. loss
   8. Water Absorption (ASTM D 543) 0.2%
   9. Bond Strength (ACI 503.4-2.3.2) 350 psi, concrete failure
   10. USDA approval Approved

C. Chemical Resistance: ASTM D 1308 – 7 day exposure, unaffected by the following:

   1. Urine
   2. Blood
   3. Gasoline
   4. Brake Fluid
   5. Mineral Spirits
   6. 25% Hydrochloric Acid
   7. 25% Sulfuric Acid
   8. 10% Acetic Acid
PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

A. General

1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.

2. Moisture Testing: Conduct calcium chloride moisture vapor emissions testing according to ASTM 1869-04. If test reading is above 3 pounds, consult flooring system manufacturer before proceeding with the work.

3. Mechanical surface preparation

a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.

b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.

c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.

d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer’s recommendations.

5. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. Allow sufficient time for the installation of the flooring system. At no time shall the speed of the project completion be allowed to detrimentally affect the application.
B. Provide sufficient light, power, heat, and working conditions to permit proper application of the material. Substrate temperature shall be a minimum of 50 deg. F. during the application and for at least 48 hours afterwards.

C. Install coved base to a thickness of 1/8” to 1/4”. Cove shall be 6” high with a ¾” to 1” radius and terminated with a metal or plastic edge strip. Cove shall be smooth and uniform in appearance to provide an easily cleanable surface. The seam between the top of the cove base and the wall shall be sealed with elastomeric sealant material.

D. Flooring system shall be installed using the double broadcast method to achieve the full specified thickness.
   1. Base resin shall consist of Epoxy 400 clear 100% solids epoxy binder.
   2. Broadcast aggregate for the first broadcast shall be 20-30 mesh Monterey type sand or 29 mesh color quartz.
   3. Broadcast aggregate for the second broadcast shall be blended 28 mesh color quartz, color as specified.
   4. Sand with 60-80 grit sandpaper and finish with Polyurethane 100 or Polyurethane 501.
   5. At true expansion joints sawcut through the finished floor system, sand smooth edges of cut, reapply polyurethane, and then seal the joints with elastomeric sealant.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection
   1. The following tests shall be conducted by the Applicator:
      a. Temperature
         1. Air, substrate temperatures and, if applicable, dew point.
      b. Coverage Rates
         1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 096723
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK: All interior work, except as noted.

A. Work also includes:

1) Painting HM doors and frames, miscellaneous metal trim.
2) Painting interior drywall partitions and ceilings.
3) Painting exposed masonry.
4) Painting newly textured existing walls.

B. Joint sealers are specified in Section 079200.

C. Steel (hollow metal) doors and frames are specified in Section 081113.

D. Gypsum drywall is specified in Section 092900.

1.2 Particular paint colors and their area of use are indicated on the drawings in the color schedule. Types of paint and coating finishes for various substrates are specified in this section.

1.3 "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.4 Paint exposed surfaces whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas.

1.5 Paint mechanical, electrical, or plumbing equipment that is exposed to public view. If equipment is in a mechanical/electrical room or within a screen at ground level, painting is not required.
Paint all exposed wiring, conduit, raceways, or piping.

1.6 Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications.

A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.

B. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such typical items as (but not limited to) wood doors, casework, exterior insulation finish system, and light fixtures.

C. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces and duct shafts.

D. Finished Metal Surfaces: Metal surfaces of stainless steel, galvanized, factory-painted or anodized aluminum, factory-painted toilet partitions, and others with factory applied finish, and similar finished materials will not require finish painting, unless otherwise indicated.

E. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts shall not be painted, unless otherwise indicated.

F. Do not paint over any code-required labels, such as Underwriters’ Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.9 SUBMITTALS:

A. Product Data: Submit manufacturer’s technical information including paint label analysis and application instructions for each material proposed for use. Provide certification of VOC content for each type of coating material.
B. Submit a list of specific paint items (type, manufacturer, formulation, and catalog number) for the Architect’s review.

C. The Contractor shall submit 2 - 8-1/2 x 11 samples of each paint finish in the specified sheens. Identify samples with color name and number and location on the job.

1.10 DELIVERY AND STORAGE:

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer’s name and label, and following information:

   Name or title of material.
   Manufacturer’s stock number and date of manufacture.
   Manufacturer’s name.
   Chemical composition.
   Supplier’s name and address.
   Color name and number.
   Application instructions.
   Material Safety Data Sheets.

B. Maintenance Stock: Contractor shall supply, new and unopened, 2 gallons of each type and color of each finish used on the project as maintenance stock for Owner. Label as indicated above and deliver for Owner’s storage.

1.11 JOB CONDITIONS:

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by paint manufacturer’s printed instructions.

B. Do not apply paint in rain, or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.
C. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES:

A. Colors are indicated on the color schedule and are typically non-stock tints, specified by a manufacturer’s color numbers. The particular manufacturer who supplies paint for project shall match these colors, subject to approval of Architect.

B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers/finishes or remove and reprime as required. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.2 MATERIAL QUALITY: The following manufacturers’ premium products are the standard products used at this campus: Dunn Edwards. Provide products from this manufacturer.
2.3 INTERIOR PAINT SCHEDULE

A. Gypsum Drywall:
   Prep – S-W 8 or 12
   
   Semi-Gloss - Cleanable
   1 coat – Vinylastic Select VNSL-00-1
   2 coats – Spartawall Interior Semi-Gloss SWLL50
   Use: Typical interior

B. Metal
   Prep – S-W 14
   1 coat – Bloc-Rust Premium Rust Preventative Primer BRPR00-1-Red Oxide
   (if previously primed, use for touchup)
   2 coats – Syn-Lustro Water-Based Rust Preventative Acrylic Semi-Gloss Paint

C. Masonry
   1 coat – Eff-Stop Premium Masonry Primer Sealer
   1 coat – Smooth BLOCFIL Select Concrete Block Filler SBSL00
   2 coats – Spartawall Interior Semi-Gloss SWLL50

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

1) Starting of painting work will be construed as Applicator’s acceptance of surfaces and conditions within any particular area.
2) Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, loose materials, or other conditions detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION:

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer’s instructions and as herein specified, for each particular substrate condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Cover items that cannot be removed. Following completion of painting of each space or area, reinstall removed items.

C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

1) Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

   a) Touch-up shop-applied prime coats on structural steel, doors and frames, wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

2) Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent. Etch or otherwise prepare surface as recommended by paint manufacturer.

3) Masonry: Clean free of all dust, dirt, oils, loose aggregates, etc. Repoint loose or missing mortar. Fill all joints. Mortar and repairs shall cure fully before application of sealer.

4) Drywall: All surfaces dust-free, clean and dry. Allow all texture to thoroughly dry.
5) Concrete: Surface shall be clean and free of curing or parting compounds. If alkali, lime, or efflorescence exists it should be cleaned off with a neutralizing agent (such as muriatic acid/water 1:4) and allowed to thoroughly dry. Concrete must be cured at least 28 days prior to application.

3.3 MATERIALS PREPARATION:

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material.

3.4 APPLICATION:

A. General: Apply all coatings in accordance with manufacturer's directions, using only recommended materials and methods. Use type of applicators and techniques best suited for substrate and type of material being applied.

B. All interior areas to be painted shall be dust-free and illuminated to no less than 1 watt per square foot.

C. Final paint thickness recommended by manufacturer is only a minimum; all paint systems shall totally cover and consistently hide the substrate upon which they are applied. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

D. Paint surfaces behind movable equipment same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or cabintry with prime coat only before final installation of equipment.

E. Paint exposed-to-view mechanical, electrical, or plumbing equipment to match adjacent surfaces. Do not paint mechanical or electrical equipment on roofs or in mechanical rooms or yards.
F. **NOTE:** Prime coat, 1st coat and finish coat shall have different colors to distinguish the level of coat applied. Submit such variation with submittals for Architect's reference.

G. Sand lightly between each succeeding enamel coat.

H. Omit first coat (primer) on metal surfaces which have been shop-primed, touch-up painted or prefinished, unless otherwise indicated.

I. **Scheduling Painting:** Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

   1) Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

J. **Minimum Coating Thickness:** Apply materials at not less than manufacturer’s recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer, and to totally and consistently cover surface to which it is applied without gaps, skips, runs, and holidays.

K. **Prime Coats:** Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

L. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

M. **Pigmented (Opaque) Finishes:** Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

N. **Completed Work:** Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.
3.5 CLEAN-UP AND PROTECTION:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day and dispose of properly.

B. Upon completion of painting work, clean window glass, pre-finished window frames, and other paint-spattered surfaces. Remove spattered paint by proper methods of cleaning and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

1) Protect floors to remain exposed during overhead painting work.

D. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

E. Disposal of Waste Materials: Recycle waste paint and empty containers if possible. Do not dump paint or clean brushes in building drains.

END OF SECTION 099100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of work:

1. Porcelain enameled markerboards – 4 each, located as shown.

1.3 SUBMITTALS

A. General: Submit product data and shop drawings. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1.4 WARRANTY

A. Porcelain Enamel Chalk and Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel chalk or markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Porcelain Enamel Markerboards: Provide balanced, high-pressure-laminated porcelain enamel markerboard of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: Provide face sheet of 24-gage enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat the exposed face and exposed edges with a 3-coat process consisting of primer, ground coat, and color cover coat, and the concealed face with a 2-coat process consisting of primer and ground coat.

   a. Cover Coat: Provide the manufacturer's standard finish coat for chalk or liquid marking, colors selected from the manufacturer's standards.

2. Core: Provide 1/2-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1 with 0.015-inch-thick aluminum sheet backing.

3. Laminating Adhesive: Provide the manufacturer’s standard moisture-resistant thermoplastic-type adhesive, low V.O.C.

4. Size: 4’ x 8’ each.

2.2 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy with AA-M12C22A32/A34 Anodic Coating, Class II Architectural Clear finish. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

   1. Chalk tray: Furnish the manufacturer's standard continuous, solid box extrusion-type aluminum chalk tray with ribbed section and closed ends, for each markerboard.

2.3 FABRICATION: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
3.1 INSTALLATION: Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

3.2 ADJUST AND CLEAN

A. Verify that accessories required for each unit have been properly.

B. Clean units in accordance with the manufacturer’s instructions. Break in only as recommended by the manufacturer.

END OF SECTION 101000
SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:

1. Division 10 Section Toilet Accessories for grab bars, wall and ADA toilet partition hooks and similar accessories. Most accessories are furnished and installed by the Owner.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of reinforcements for compartment-mounted grab bars.
2. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: Provide manufacturer’s standard colors and chips for selection.

1.4 QUALITY ASSURANCE

B. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

D. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 STEEL UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Accurate Partitions Corporation.
2. All American Metal Corp.
4. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. Flush Metal Partition Corp.
8. Global Steel Products Corp.
9. Hadrian Manufacturing Inc.
11. Metpar Corp.
12. Sanymetal; a Crane Plumbing company.
B. Toilet-Enclosure Style: Floor and ceiling anchored.

C. Urinal-Screen Style: Wall hung with integral flanges.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer’s standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.

2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.

E. Urinal-Screen Construction:

1. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches thick.

F. Facing Sheets and Closures: Electrolytically coated or hot-dip galvanized-steel sheet with nominal base-metal (uncoated) thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer’s standard thickness, but not less than 0.036 inch.

2. Panels: Manufacturer’s standard thickness, but not less than 0.030 inch.

3. Doors: Manufacturer’s standard thickness, but not less than 0.030 inch.

4. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer’s standard thickness, but not less than 0.030 inch.

G. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer’s standard design; stainless steel or aluminum.

I. Steel-Sheet Finish: Immediately after cleaning and pretreating, apply manufacturer’s standard baked-on powder coating finish. Comply with coating manufacturer’s written instructions for applying and baking.

1. Color: One color as selected by Architect from manufacturer’s full range.
2.3  ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated zamac.
2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at outswinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
6. Hook and Bumper: Provide manufacturer's standard projecting rubber-tipped door bumper with hook at inswinging doors.

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 or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4  FABRICATION

A. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, inswinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.
PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

   1. Maximum Clearances:
      
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.

B. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113
SECTION 102800 – TOILET ACCESSORIES

PART 1 - GENERAL

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

1.2 SUBMITTALS

A. General: Submit product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

1.3 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.4 WARRANTY: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

A. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Bobrick numbers are used for specification purposes. Other manufacturers' products that are acceptable include:

2. American Specialties, Inc.
4. McKinney/Parker.
2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.


G. Fasteners: Screws, bolts, and other devices of galvanized steel where concealed.

2.3 TOWEL DISPENSERS: By Owner.

2.4. TOILET TISSUE DISPENSERS: By Owner.

2.5 SOAP DISPENSERS: By Owner.

2.6 GRAB BARS: 18 ga. stainless steel, concealed mounting with snap flange, minimum 1-1/4” diameter with peened or other abrasive finish. Equal of ASI 3700 series of lengths and configurations as shown on the drawings.

2.7 MIRRORS: Stainless steel channel-framed mirror. Equal Bobrick B-165 1830.

2.8 SINGLE HOOKS: Stainless steel with integral bumper, equal of Bobrick B-212682.

A. Quantity: 2 each shower stall located by Architect

2.9 SHOWER CURTAIN RODS: Stainless steel pipe, 20 ga. x 1” diameter, with 1-3/8” flanges and concealed wall brackets. Equal of Bobrick B-207, length as needed for locations shown. Curtains by Owner.
2.10 FOLDING SHOWER SEATS: Stainless steel support frame, folds up and locks into place. Drainable ½" phenolic top. Supports 350 lb. Reversible. Equal Bobrick B-5181.

2.11 FABRICATION

A. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

B. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units according to manufacturers’ instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Install grab bars to withstand a downward load of at least 250 lbf, and shower seats a load of 350 lbf, complying with ASTM F 446. Coordinate for support/blocking in walls.

C. Provide continuous sanitary sealant, specified in Section 079200 - Joint Sealers, concealed under surface flanges against walls.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Test all grab bars and shower seats to see that they support loads without movement.
C. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800
SECTION 104413- FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Fire extinguishers.
   2. Fire extinguisher cabinets.

B. Provide extinguishers with cabinets located as shown on the drawings.

1.3 SUBMITTALS

A. General: Submit product data for fire extinguishers and cabinets, including rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

1.4 QUALITY ASSURANCE

A. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer’s standards that comply with local codes.

B. Multipurpose Dry Chemical Type: UL-rated 3A-40BC, 5-lb nominal capacity, in enameled steel container with chrome-plated brass valves.
2.2 CABINET

A. Construction: Manufacturer’s standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

B. Cabinet Mounting: Suitable for the following mounting conditions:

   1. Surface-mounted on masonry partitions.

C. Door and Trim Material and Construction: Manufacturer’s standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

   1. Painted steel.
   2. Door Glazing: Full glazed, tempered clear.

D. Door Hardware: Provide pull with roller catch and continuous hinge.

2.3 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

2.4 STEEL CABINET INTERIOR FINISHES:

A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

B. Factory-Priming for Field-Painted Finish: Apply shop primer immediately following surface preparation and pretreatment.

C. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer’s standard two-coat baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer’s instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils. Paint entire cabinet inside and out, color - white.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Follow manufacturer’s printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Fasten cabinets to structure, square and plumb.

END OF SECTION 104413
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following for the Locker Rooms:

1. All welded metal lockers.
2. Dimensions: 18” W x 16” D x 72” H

1.3 DEFINITIONS

A. Uncoated Steel Sheet Thickness: Indicated as the minimum thickness.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show bottom closure, sloping top, and other accessories.
2. Include locker identification system.

C. Samples to verify initial color selection match to Women’s lockers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of metal locker manufacturer for installation and maintenance of units required for this Project.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal lockers.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

1.7 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

1.8 WARRANTY: Art Metal Products Twin-Frame All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

PART 2 – PRODUCTS

2.1 General: College district standard lockers shall be "AMP Pro-Sport Twin-Frame All-Welded Sport Lockers" as manufactured by Art Metal Products or approved equal. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.

A. Lockers shall be GREENGUARD Children & Schools CertifiedSM

2.2 Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade enamel electrostatically sprayed and baked at 325 degrees Fahrenheit for a minimum of 30 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.

A. Color: 719 Jersey (to match Women’s lockers)
2.3 Twin-Frame / Vertical Side Panels: Shall be of integral frame and side wall construction manufactured from 16 gauge sheet steel. The one-piece side/frame shall be formed to provide a continuous door strike on the hinge side. An additional continuous vertical door strike shall be achieved at the latch side by MIG welding a 16 gauge full height channel frame member to the integral locker side producing a rigid torque-free welded locker body. The frame shall include a tab which engages a slot in the base locking the side panel and frame into position. Sides to be diamond perforated for added ventilation.

2.5 Integral Frame Locker Base: 4" high X 16 gauge formed sheet steel with double return flanges at the front and rear. A full depth horizontal channel shall be MIG welded under the locker bottom front-to-back at the left and right side of each welded locker unit as well as beneath each vertical side panel for maximum rigidity.

2.6 Sloping Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple locker unit.

2.7 12" Wide Security Box with Adjacent Hat Shelf: Formed of 16 ga. cold rolled sheet steel and securely MIG welded in place. The Security Box Door shall be 14 ga. cold rolled sheet steel (plain non-ventilated). A continuous hinge shall be MIG welded to the door and riveted to the body of the box. Door shall have a padlock strike plate. Hat shelf shall have double bends at front and be MIG welded in place at the sides.

2.8 Foot Locker: Seat shall be formed of 14 ga. cold rolled sheet steel with stiffener sections for reinforcement and be prepared for padlock. Foot locker front panel shall be 14 ga. cold rolled sheet steel with secure ventilation. A rubber bumper shall be mounted to the locker back to cushion seat in the open position. Provide padlock strike plate.

2.9 Coat Rod: Stainless steel, heavy duty 1” dia. Stainless steel tubing.

2.10 Backs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple twin-framed unit and be welded to each vertical side panel.

2.11 Twin-Frame/Vertical Side Panels: Shall be of integral frame and side wall construction manufactured from 16 gauge sheet steel. The one-piece side/frame shall be formed to provide a channel on the hinge side. An additional 16 gauge full height channel frame member shall be MIG welded to the integral locker side of 2-wide units producing a rigid torque-free welded locker body. The frame shall include a tab which engages a slot in the base locking the side panel and frame into position. Sides to be diamond perforated for added ventilation.
2.12 Integral Frame Locker Base: 16 gauge formed sheet steel with double return flanges at the front and rear. A full depth horizontal channel shall be MIG welded under the locker bottom front-to-back at the left and right side of each welded locker unit as well as beneath each vertical side panel for maximum rigidity.

2.13 Locking: Provide padlock hasp for each locker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

B. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion, using concealed fasteners.

1) Anchor single rows of metal lockers to walls near top and bottom of lockers.

C. Equipment and Accessories: Fit exposed connections of closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

2. ADJUSTING, CLEANING, AND PROTECTION

a. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker use during construction.
b. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

END OF SECTION 105115
SECTION 210500 – COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 RELATED WORK

A. General Conditions

B. Special Conditions

C. Supplementary General Conditions

D. Architectural, Structural, Civil, Electrical and Mechanical Drawings & Specifications

1.2 SCOPE OF WORK

A. The work covered by the Mechanical and Plumbing Sections of the Specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, inspections, utilities and incidentals necessary for the complete installation of all mechanical and plumbing work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction is required for work indicated or specified in this Section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

C. The Contractor shall visit the premises and thoroughly familiarize himself with all the details of the work and working conditions and to verify all dimensions in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor’s site visit, the coordination of all existing conditions, and the inclusion of all considerations for existing conditions.

1.3 PLANS AND SPECIFICATIONS

A. These Specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted to the Architect for
review. No departures shall be made without prior written acceptance of the Architect.

C. The interrelation of the specifications, the drawings, and the schedules is generally as follows: The specifications determine the nature and setting of the materials, the drawings establish the quantities, dimensions, and details, and the schedules give the performance characteristics.

D. Should the drawings disagree in themselves or with the specifications, the contractor shall immediately notify the architect and shall perform and/or furnish the better quality or greater quantity of work or materials unless otherwise directed by the architect in writing. In case the specifications should not fully agree with the schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large scale details govern small scale drawings. In case of disagreement between specifications and drawings, see Division I of these specifications for clarifications.

E. Items specifically mentioned in the specifications but not shown on the drawings and/or items shown on the drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 QUALITY ASSURANCE

A. All work shall comply with the applicable rules of the following:

1. 2012 International Building Code

2. 2012 International Mechanical Code

3. 2012 International Plumbing Code

4. 2012 International Fire Code


6. National Fire Protection Association Codes

7. State Fire Marshall


9. All applicable city, county, state, and federal rules, codes, and ordinances.
B. In any instance where these specifications call for materials for construction of a better quality or larger size than required by the codes, the provisions of these specifications shall take precedence. None of the terms or provisions of this specification shall be construed as waiving any rules, regulations, or requirements of these authorities. The codes shall govern in case of direct conflict between the codes and the Drawings.

1.5 SUPERVISION

A. A competent foreman or superintendent, initially approved by the Architect, shall be assigned to the project to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Architect. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the Architect's representative. Recommendations made by the observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced at once, to the satisfaction of the Architect.

1.6 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of two (2) years after the final acceptance of work.

1.7 UTILITIES

A. The contract documents reflect the general location, size, and elevations of sewer line, location, size and pressure of water and other lines and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local utility companies in order to coordinate and confirm the exact requirements for each utility to provide a complete and operative system. The bid submitted by the Contractor shall include costs for all such utility company charges and/or fees.

1.8 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. It shall be the responsibility of the Contractor to consult the architectural and engineering drawings and details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The Drawings are diagrammatic in character and cannot show every connection in detail or every pipe and duct in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall
coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases or above suspended ceilings, etc., in finished portions of the building, unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the approval of the Architect, and he reserves the right to make any reasonable changes in the locations indicated without additional cost.

1.9 SHOP DRAWINGS AND BROCHURES

A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of work. At least two weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data.

B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

C. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: the Title of the Sheet or Brochure; name and location of the building; names of the Architect, Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and/or Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:
I. Shop Drawings: Drawings shall be drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by skilled technicians experienced in this type of work. All piping, equipment layouts, ductwork and similar Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.

2. Brochures: Brochures shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space. Brochures not compiled in the manner described below shall be returned for resubmittal.

3. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.

D. The submittal format shall follow the Specifications format with a submittal required for each section of Division 15. Each major category of equipment such as fans or pumps or air devices being submitted under a separate cover letter. The first submittal shall be accompanied by a three-ring hard back binder for the A/E to use in retaining copies of the submittals. Copies of each submittal shall be three-hole punched and arranged (or folded if required) for the A/E's filing convenience. Provide one copy of updated TABLE OF CONTENTS and progressive-tabbed manila index sheets also for the A/E's filing convenience.

E. Submit six (6) copies of all Shop Drawings and Brochures for review and approval. One set will be retained by the Engineer, one set by the Architect for record purposes.

F. Minimum size of submittal data shall be 8-1/2" x 11".

G. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Architect reserved the right to require the Contractor to furnish items exactly as described in the Contract Documents.

H. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they are not equal. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contractor is not able to furnish an acceptable alternate until the
proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Architect and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Architect based on the particular circumstances.

1.10 SUBSTITUTIONS

A. The listing of product manufacturers, catalog numbers, etc., in the various sections of the specifications is intended to establish a standard of quality only, and is not intended to preclude open, competitive bidding. The Contractor may at his option submit substitute materials or methods which he feels are equal or superior to those specified. If the Contractor does submit alternate materials or methods, it shall be understood that the Contractor:

1. Has personally investigated the proposed substitute product and determined that it has all the same accessories and is equal or superior in all respects to the item specified.

2. Will provide the same guarantee for the substitution that he would for that specified.

3. Has coordinated the installation of the equipment which he proposes to substitute with all other trades especially in regard to electrical requirements and to operating weights trades and includes the costs for any changes required for the work to be complete in all respects. The Contractor will prepare shop drawings where required by the Architect or where dimensions vary.

4. Waives any and all claims for additional costs related to the substitution.

1.11 SPARE PARTS DATA

A. As soon as practicable after approval of materials and equipment, and, if possible, not later that one months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and sources of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the contract. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee specified.

1.12 RECORD DRAWINGS

A. The Contractor shall keep a set of Drawings of the job, noting daily all changes made in the Drawings in connection with the final installation including exact
dimensioned locations of all new and uncovered existing active and inactive utilities outside the building and shall turn over a clean, neatly marked set of sepia reproducible Drawings showing "as-built" work to the A/E for delivery to the Owner. All underground utilities and services and systems shall be accurately located by the Contractor and dimensioned on the "as-built" Drawings.

1.13 OPERATING AND MAINTENANCE MANUAL

A. Prepare and submit to the Architect for delivery to the Owner an indexed manual with complete technical data for every piece of equipment and material installed under this contract.

1. Complete fire suppression submittals as approved by Architect.

2. Manufacturer's installation instruction brochures.

3. Manufacturer's local representative and/or Distributor's name, address and phone number.

4. Manufacturer's operating and maintenance brochures.

B. This manual shall include all of the listed data bound into a permanent hard-back binder identified on the cover as "Operating and Maintenance Manual" with additional cover display of the names and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Sub-Contractors installing equipment represented in the brochure.

C. Contents of the Manual shall be grouped in sections according to the various sections of Division 21 and shall be listed in a Table of Contents.

PART 2 PRODUCTS

2.1 STANDARDS FOR MATERIALS

A. All materials, in general, shall conform to the requirements of all agencies of publications hereinbefore specified under the paragraph QUALITY ASSURANCE and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized testing agency indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all contract requirements.
2.2 STANDARD PRODUCTS

A. Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

2.3 MANUFACTURERS INSTRUCTIONS

A. The responsibility for the furnishing of the proper equipment and/or material and the responsibility for seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor. If needed for proper installation, operation, or startup, the Contractor shall request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers’ published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the contract documents and the manufacturers’ directions and shall obtain the Architect’s instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturers’ directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.

2.4 RUST PREVENTION

A. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.5 STORAGE ON SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is a suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

2.6 CAPACITIES

A. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.

2.7 NAMEPLATES
A. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of final inspection.

2.8 CONDITION OF MATERIAL AND APPURTENANCES

A. All pipe, fittings, appurtenances, and other material required for complete installation of these systems shall be new to conform to manufacturer's recommendations, unless otherwise specified. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of substantial completion, shall be replaced by the Contractor without extra cost to Owner.

PART 3 EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of system. No union will be required in welded lines or lines assembled with solder joint fittings, except at equipment items, machinery items, and other special pieces or apparatus. Companion flanges on lines at various items of equipment, machines and pieces of apparatus, shall serve as unions to permit removal of the particular items. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.

3.2 SPACE AND EQUIPMENT ARRANGEMENT

A. All equipment shall be installed in a manner to permit access to parts requiring service without disassembly of other equipment.

B. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly protected against damage.

3.3 PRECEDENCE OF WORK

A. This contract includes many different systems furnished and installed by different trades. Each trade shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping any other trades.
3.4 EXCAVATION AND BACKFILL

A. The Contractor shall perform all excavation of every description required in the execution of his work. Excavation shall be through whatever substance encountered, to the depths indicated on the drawings, or as required. Excavated material suitable for backfill shall be piled in an orderly manner a sufficient distance from the trench to prevent overloading sides and causing cave-ins. Excavated materials not suitable for backfill shall be removed or stored as directed. Such grading shall be done as is necessary to protect the excavation from surface water. Trenches shall be maintained in a dry condition by bailing, pumping, or other approved methods. Pipe shall not be laid in wet trenches. Sheetimg and shoring shall be provided as required for the protection of the work and the safety of personnel.

B. Trenches shall be of the necessary width and depth to provide for proper laying of pipe and appurtenances, with banks as nearly vertical as possible. Bottoms of trenches shall be excavated to the grade and depth indicated or required, and barrel of pipe shall be laid on firm and undisturbed soil. Bell holes, of a size to permit proper grading, shall be provided as required. Over-depth excavations shall be backfilled to proper level with sand. When rock or other soil not suitable for bedding the pipe is encountered, it shall be removed to a depth of not less than 1' below grade, and backfilled with sand to grade, to provide a suitable bed for pipe. Existing underground piping shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired to the Architect's satisfaction, at the Contractor's expense.

C. Trenches shall not be backfilled until all required tests have been performed. This requirement does not preclude sectional testing and backfilling of the various systems. Trenches shall be carefully backfilled with a minimum 6" sand cover over piping then backfilled with material (free from large earth clods, rocks, and/or foreign materials), laid in 6" layers, compacted to 90 percent of maximum dry density as determined by ASTM D698 (compaction shall be to 95 percent below structures, including sidewalks and roadways).

D. Open trenches abutting foundation or basement excavations, building walls, and grade beams, will not be permitted, but shall be backfilled and completed, for a distance of not less than 10' from the above features, as soon as possible. All damage resulting from flooding due to open trenches shall be paid for by the Contractor.

E. Where excavation requires, existing walks, street, drives, or other existing pavement shall be cut to install new lines and to make new connections to existing lines. The size of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new materials is completed and the
excavation has been backfilled, the paving shall be patched, using materials to match those cut out. The patches shall be thoroughly bound with the original surfaces, and shall be level with them.

3.5 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to permit installation of any work under this section of the specifications or to repair any defects that may appear, up to the expiration of the guarantee period, such cutting shall be done under the observation of the Architect by the Contractor. The Contractor shall not be permitted to cut or modify any structural members without the written direction of the Architect.

B. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades occasioned by the cutting operations, or occasioned by the failure of any part of work installed under this contract, shall be performed by the trade whose work is involved, but shall be paid for by the Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.

3.6 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide his own hoisting facilities to set his materials and equipment in place in the building, as indicated on drawings and for subsequent cleaning, testing, and adjusting.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to the job, in accordance with intent of these documents.

3.7 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the project site.

B. At completion of the job, the Contractor shall remove all of his tools, scaffolding, and surplus materials. He shall leave the area "broom clean."
3.8 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Unless specifically shown, indicated, or specified to the contrary, each item shown or required by the Mechanical Drawings or specified in the Mechanical Specifications shall be accompanied by all motors and starting and controlling equipment necessary for the items' proper operations. These motors shall be integrally attached to and/or installed with their associated equipment item and electrically connected as specified in Division 16 - Electrical. Equipment controlled from motor control centers shall be supplied with motors only. Motor control centers are specified in the Electrical Specifications and shown on the Electrical Drawings.

END OF SECTION
SECTION 210529 - SUPPORTS, ANCHORS AND SLEEVES FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 WORK INCLUDED
   A. Pipe Hangers and Supports

1.2 RELATED WORK
   A. Section 210500 – Common Work Results For Fire Suppression
   B. Section 211313 - Wet Pipe Sprinkler System

1.3 SUBMITTALS
   A. Submit shop drawings in accordance with Section 210500 Common Work Results For Fire Suppression.

1.4 REFERENCES

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
   A. Products shall be as manufactured by Grinnell, Elcen, Fee and Mason, Unistrut or approved equal.

2.2 INSERTS
   A. Malleable iron case of galvanized steel sheet and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
   B. Size inserts to suit threaded hanger rods.

2.3 PIPE HANGERS AND SUPPORTS
   A. Hangers: Pipe sizes 1/2 inch to 1-1/2 inch: adjustable wrought steel ring.
B. Hangers: Pipe sizes 2 inches to 4 inches: adjustable wrought steel clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Vertical Support: Steel riser clamp.

E. Steel Beam Clamps: Elcen Figure 33, Type 3 or approved equal.

F. Expansion Anchors: Phillips Red Head or approved equal.

G. Design hangers to impede disengagement by movement of supported pipe.

2.4 HANGER RODS

A. Provide cadmium plated steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

2.5 SLEEVES

A. Pipes through Walls, Fire Proofing, Footings, Potentially Wet Floor: Form with galvanized steel pipe.

B. Size large enough to allow for movement due to expansion and to provide for continuous installation.

PART 3 EXECUTION

3.1 INSERTS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inch or ducts over 60 inches wide.

C. Where concrete slabs form finished ceiling finish inserts, flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. All structures and appurtenances employed for the purpose of supporting the pipe and guiding it properly shall be carefully fabricated in such a manner as to preserve the true grade of the pipe without subjecting either the pipe or the supporting and guidance members to any undue strain.
B. Support horizontal piping as follows:

C. Space hangers and furnish rods as follows:

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<tr>
<th>Nominal Pipe Size (in.)</th>
<th>Span (ft.)</th>
<th>Hanger Rod Diameter (in.)</th>
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D. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.

E. Place a hanger within one foot of each horizontal elbow.

F. Use hangers which are vertically adjustable 1-1/2 inch maximum after piping is erected.

G. Support piping at each change or direction, at ends of branches, at base and top of riser pipes and drops, and wherever necessary to prevent sag, bending or vibration, in addition to above-listed hanger spacing.

H. Support vertical piping at every floor.

3.3 PRIMING

A. Prime coat non-galvanized steel hangers and supports.

3.4 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through potentially wet floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.
C. Where piping passes through floor, ceiling or wall close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

D. Install chrome plated escutcheons where piping passes through finished surfaces.

E. Provide pipe sleeves for all piping.

F. Size pipe sleeves to permit placing pipe.

G. Sleeves for pipes through floor slabs standard weight galvanized steel pipe with top of sleeve projecting 2 inches above finished floor. For waterproof sleeves.

H. Sleeves for pipe through walls standard weight galvanized steel pipe or 18-gauge galvanized sheet metal with ends flush with wall surface.

I. Seal pipes passing through walls or slabs. Use mastic or oakum seal in the annular space in non-fire-rated walls; use Dow-Corning 3-6548 silicone RTV foam firestop sealant or equal in the annular space in fire-rated walls or other envelopes.

J. Seal exposed pipe passing through floor slabs with Dow-Corning 3-6548 silicone RTV foam firestop sealant or equal and point with caulking compound. Strike off flush at top of sleeve.

K. Sleeves penetrating exterior walls below grade shall be standard weight, black steel pipe with 1/4" thick steel plate secured to the pipe with a continuous fillet weld. The plate shall be located in the middle of the wall and shall be 4" wider all around than the sleeve it encircles. The entire assembly shall be hot dipped galvanized after fabrication. The pipe passing through the sleeve shall be centered within the sleeve and the annulus opening sealed with "Link Seal" casing seals manufactured by Thunderline Corporation, Wayne, Michigan. Series 300 for pipe sizes 1/2" through 10" and series 400 or 500 for larger pipe sizes or equal.

L. All piping shall be installed with due regard to expansion and contraction. Type of hanger, methods of support, location of supports, etc., shall be governed in part by this consideration.

END OF SECTION
SECTION 211313 - WET PIPE SPRINKLER SYSTEMS

PART 1   GENERAL

1.1 RELATED DOCUMENTS

A. All work performed under this Section of the Specifications shall be in strict accordance with the provisions of the General Conditions and Requirements, and Section 210500 Common Work Results For Fire Suppression.

1.2 WORK INCLUDED

A. The design and installation of a complete wet pipe automatic sprinkler system including exterior and interior water piping, sprinkler heads, valves, hangers and supports, sleeves, Fire Department connections and accessories.

B. Verification of all design criteria stated within these documents (including but not limited to Hazard Occupancy Classification, Design Density and Availability of Water) prior to bidding. If a conflict is found between the stated design criteria and any governing agency, the contractor shall notify the Architect prior to bidding.

1.3 RELATED WORK

A. Section 210500 – Common Work Results For Fire Suppression

B. Section 210523 – Valves For Fire Suppression

C. Section 210529 – Supports, Anchors and Sleeves For Fire Suppression

1.4 REFERENCE STANDARDS

A. NFPA No. 13: Sprinkler Systems

B. NFPA No. 24: Fire Department Connections

C. Local Fire Code and State Fire Marshal Requirements

1.5 QUALITY ASSURANCE

A. Sprinkler equipment, design and installation shall meet the requirements, recommendations of local authority having jurisdiction and the Owner's Insurance Underwriters.

B. The design, equipment furnished and installation shall meet the requirements of NFPA No. 13, "Standard for the Installation of Sprinkler Systems."
C. Systems shall be tested in accordance with NFPA-13. Test shall be witnessed by Architect and approved in writing prior to activation.

D. The system shall be designed and installed by a firm regularly engaged in the design and installation of automatic fire protection systems, in accordance with the requirements of the National Fire Protection Association, or by an authorized Agent of such firm. Evidence to support the above requirements may be requested, and any proposed installer who cannot show suitable experience will be rejected.

E. Standard Products: Materials and equipment shall be standard products of the manufacturer's latest design, and suitable to perform the functions intended. The name of the manufacturer, and the serial numbers, shall appear on all major components and shall bear the UL or FM label or marking. Equipment added to an existing system shall function in the same manner as similar components of the existing system.

F. Conformance to Agency Standards: Submit evidence of conformance of the entire system to the requirements of NFPA 13 standards, and of the Arizona State Fire Marshal and the Authorities having Jurisdiction. Required changes to meet code, insurance or jurisdictional authority requirements are to be made by the sprinkler contractor at no additional cost to the Owner.

1.6 SUBMITTALS

A. Submit shop drawings in accordance with Section 210500.

B. Fire sprinkler system shop drawings shall be submitted to the Architect prior to any submittals to any AHJ. The Architect's comments shall be incorporated into revised plans as required, shall be revised and resubmitted to the Architect for verification of compliance with design intent, and after Architect approval shall be submitted to the AHJ. If the AHJ makes revisions, the plans shall again be submitted to the Architect for review prior to resubmittal to the AHJ. No installation shall proceed without plans approved by both the Architect and the AHJ.

C. The shop drawings shall include detailed plans of sprinkler systems, calculations, sections and plot plan indicating the locations of underground supply connections, control valves, fire department connections, and other equipment to be used. Submit manufacturer's data on materials and equipment.

1.7 SYSTEM DESCRIPTION

A. System to provide full coverage for the entire building.
B. Provide a complete hydraulically designed system to meet NFPA 13 standards and occupancy requirements and hazard classifications as indicated on the drawings. Contractor shall be responsible for pressure and flow verification with the jurisdiction having authority prior to final design and system installation.

C. The location of equipment and piping mains shall conform as closely as possible to that shown on the plans. Contractor is advised, however, that the information shown on the plans is intended to indicate the general intent and scope of the project for bidding purposes only. Contractor shall use the drawings for reference only during bidding, and shall be fully responsible for the actual final arrangement of piping, head locations, and spacing and other system details as required to conform to the requirements of authorities having jurisdiction. Required changes to meet code, insurance, or jurisdictional authority requirements are to be made by the Sprinkler Contractor at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products manufactured by Automatic Sprinkler, ITT Grinnell, Viking, Central or approved equal meeting these specifications are acceptable.

B. All materials and equipment used in the installation of the fire protection system shall be listed as approved by the underwriters Laboratories, Inc., list of inspected Fire Protection Equipment and Materials, and the Factory Mutual Testing Laboratories list of approved equipment. Fire protection devices and devices involving fire hazard shall be the latest design of the manufacturer.

2.2 SPRINKLER PIPING AND PIPE FITTINGS

A. Piping Systems:

1. **Exterior Water Pipe:** Pipe shall be ductile iron pressure pipe with ductile iron fittings and mechanical joint connections.

2. **Interior Water Pipe:** Piping, fitting, valves, and installation shall be as specified in NFPA 13.

2.3 SPRINKLER HEADS

A. Unless otherwise specified or indicated on the drawings, sprinkler heads shall be regular automatic closed-type except that sprinkler heads to be installed in the vicinity of heating equipment and lights, shall be of the temperature rating required for such locations by National Fire Protection Association Standard No. 13.
B. In finished or suspended ceiling areas, provide recessed type sprinklers to Gem Model FR948 with chrome plated finish and white escutcheon.

C. In the Mechanical rooms, or exposed areas, provide upright sprinklers equal to Gem Model F950 in bronze finish.

D. For sidewall application, provide sidewall sprinklers equal to Gem F950/Q46 type with chrome plated finish and escutcheon.

2.4 VALVES

A. Provide gate valves, butterfly valves and check valves in accordance with Section 210523.

B. The fire riser shall have a main indicating butterfly valve for shut off control in accordance with Section 210523.

2.5 ALARM DEVICES

A. Riser water flow indicator switch shall be U.L. listed. Potter Model VSR-A or approved equal. Flow switch shall have two sets of contacts.

B. Sprinkler system control valves, riser butterfly valve indicator, post valves and other valves required by NFPA-13 or the local authority shall be furnished with a tamper switch. Tamper switch shall have two sets of contacts.

C. Furnish and install a 6” electric alarm equal to Central Sprinkler Corp.

2.6 SIAMESE FIRE DEPARTMENT CONNECTION

A. Provide two-way standard siamese fire department connection with chrome plated finish, local Fire Department thread, dust caps and chains, 3/4 inch automatic drip (connected to drain) marked "Automatic Sprinkler -Fire Department Connection".

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate the work of this Section with other affected work. This installation shall not cause interference with that of other trades.

B. All openings for piping should be anticipated and indicated on the approved and accepted shop drawings. Any additional cutting of openings must have the written approval of the Architect/Engineer.
3.2 INSTALLATION

A. Locate the fire department connection with sufficient clearance from walls or obstructions to allow full swing of fire department wrench handle.

B. Place pipe runs to avoid obstruction and interference with other work. Run piping in concealed spaces above finished ceilings. In exposed areas, piping will be kept at a minimum distance from the ceiling.

C. Piping shall allow for drainage at the riser. Trapped areas, if unavoidable, shall be provided with drains as required by NFPA 13.

D. Extend discharge of inspectors test valve, alarm valve and drains to curb or other point to avoid discharge across walks or into occupied areas.

E. Provide signs as required by Code to identify all items.

F. The fire protection system shall be tied into the building fire alarm system.

G. Support sprinkler piping from building structure with hangers and supports in accordance with NFPA Standard No. 13. Space hangers per NFPA No. 13. Furnish and install intermediate steel supports as required. Attach hangers or rods to concrete roof and floor structures with devices compatible with the structural types as approved by architect. Weight of piping and valves must be supported in a manner which does not impose eccentric loads on structural elements.

H. Actual number, spacing and location of heads, size and routes of piping shall be provided in accordance with the applicable Specifications and acceptable Shop Drawings.

I. All layouts, head spacing, coverage, etc., as may be required by the referenced authorities and/or Architectural and Structural conditions, shall be made without increase in cost to the Owner or the Architect. Pay careful attention to NFPA beam rules in laying out heads. Ducts, conduit bundles and other building items fall under the beam rules.

J. Heads shall be located in a symmetrical pattern related to ceiling features such as beams, light fixtures, diffusers, etc., and where applicable, heads shall be located symmetrical with the grid ceiling. Heads shall be centered (both directions) in a 2 x 2 ceiling tile or arranged in a manner acceptable to the Architect prior to installation. Heads protruding below escutcheon are not acceptable. Heads shall be semi-recessed. Carefully coordinate with other trades to avoid conflict with ducts, conduit, lights and structural items.
K. The Contractor shall provide spare heads equal to one percent of the total number of heads installed under the Contract, but not less than 10.

L. The heads shall be packed in a suitable sprinkler cabinet and shall be representative of, and in proportion to, the number of each type and temperature rating of heads installed.

M. In addition to the spare heads, the Contractor shall provide not less than one special sprinkler head-wrench for each type of head. The cabinet shall be located where directed by the Architect, or on the wall near sprinkler valve.

N. Run piping above furred ceiling and in joists to avoid obstructions. Coordinate with other trades to insure there are no conflicts or interferences.

O. Protect sprinkler heads in exposed areas against mechanical injury with standard guards.

P. Locate outside alarms on the wall of the building above the Fire Department connection.

Q. Fire sprinkler subcontractor shall be responsible for defining the required electrical connection to the Fire Alarm Panel with the electrical subcontractor. Electrical subcontractor will perform electrical installation of conduit and wire. Fire sprinkler subcontractor shall be responsible for coordinating work with the electrical subcontractor.

R. The service line entering the building shall have all joints strapped flange to flange for kickout protection. The building structure shall not be used as a kick block and full clearance through the building wall or floor shall be maintained.

3.3 ACCEPTANCE AND TESTING

A. During the fabrication and assembly of all piping, prior to testing and before connection is made to any equipment, the piping shall be blown with dry, oil-free compressed air to clear the pipe of dirt, welding slag and other materials which may be harmful to sprinkler heads and other equipment.

B. Prior to connecting to the overhead sprinkler piping, the underground main shall be flushed in the presence of the Architect and a representative of the authorities having jurisdiction and meet with their approval.

C. After completion of the installation, the entire system shall be tested by the contractor for acceptance by the authorities having jurisdiction.
D. The contractor shall provide and complete all forms required for testing and acceptance of the system. Copies of these documents shall be provided to the authorities having jurisdiction, the owner and the Architect, in accordance with Section 210500 Common Work Results For Fire Suppression.

END OF SECTION
SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 RELATED WORK

A. General Conditions

B. Special Conditions

C. Supplementary General Conditions

D. Architectural, Structural, Civil, Electrical and Mechanical Drawings & Specifications

1.2 SCOPE OF WORK

A. The work covered by the Mechanical and Plumbing Sections of the Specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, inspections, utilities and incidentals necessary for the complete installation of all mechanical and plumbing work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction is required for work indicated or specified in this Section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

C. The Contractor shall visit the premises and thoroughly familiarize himself with all the details of the work and working conditions and to verify all dimensions in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit, the coordination of all existing conditions, and the inclusion of all considerations for existing conditions.

1.3 PLANS AND SPECIFICATIONS

A. These Specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect.
for review. No departures shall be made without prior written acceptance of the Architect.

C. The interrelation of the specifications, the drawings, and the schedules is generally as follows: The specifications determine the nature and setting of the materials, the drawings establish the quantities, dimensions, and details, and the schedules give the performance characteristics.

D. Should the drawings disagree in themselves or with the specifications, the contractor shall immediately notify the architect and shall perform and/or furnish the better quality or greater quantity of work or materials unless otherwise directed by the architect in writing. In case the specifications should not fully agree with the schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large scale details govern small scale drawings. In case of disagreement between specifications and drawings, see Division I of these specifications for clarifications.

E. Items specifically mentioned in the specifications but not shown on the drawings and/or items shown on the drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 QUALITY ASSURANCE

A. All work shall comply with the applicable rules of the following:

1. 2012 International Building Code
2. 2012 International Mechanical Code
3. 2012 International Plumbing Code
4. 2012 International Fire Code
6. National Fire Protection Association Codes
7. State Fire Marshall
9. All applicable city, county, state, and federal rules, codes, and ordinances.
B. In any instance where these specifications call for materials for construction of a better quality or larger size than required by the codes, the provisions of these specifications shall take precedence. None of the terms or provisions of this specification shall be construed as waiving any rules, regulations, or requirements of these authorities. The codes shall govern in case of direct conflict between the codes and the Drawings.

1.5 SUPERVISION

A. A competent foreman or superintendent, initially approved by the Architect, shall be assigned to the project to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Architect. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the Architect's representative. Recommendations made by the observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced at once, to the satisfaction of the Architect.

1.6 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of two (2) years after the final acceptance of work.

1.7 UTILITIES

A. The contract documents reflect the general location, size, and elevations of sewer line, location, size and pressure of water and other lines and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local utility companies in order to coordinate and confirm the exact requirements for each utility to provide a complete and operative system. The bid submitted by the Contractor shall include costs for all such utility company charges and/or fees.

1.8 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. It shall be the responsibility of the Contractor to consult the architectural and engineering drawings and details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The Drawings are diagrammatic in character and cannot show every connection in detail or every pipe and duct in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall
coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases or above suspended ceilings, etc., in finished portions of the building, unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the approval of the Architect, and he reserves the right to make any reasonable changes in the locations indicated without additional cost.

1.9 SHOP DRAWINGS AND BROCHURES

A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of work. At least two weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data.

B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

C. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: the Title of the Sheet or Brochure; name and location of the building; names of the Architect, Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and/or Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:
I. Shop Drawings: Drawings shall be drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by skilled technicians experienced in this type of work. All piping, equipment layouts, ductwork and similar Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.

2. Brochures: Brochures shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space. Brochures not compiled in the manner described below shall be returned for resubmittal.

3. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.

D. The submittal format shall follow the Specifications format with a submittal required for each section of Division 15. Each major category of equipment such as fans or pumps or air devices being submitted under a separate cover letter. The first submittal shall be accompanied by a three-ring hard back binder for the A/E to use in retaining copies of the submittals. Copies of each submittal shall be three-hole punched and arranged (or folded if required) for the A/E's filing convenience. Provide one copy of updated TABLE OF CONTENTS and progressive-tabbed manila index sheets also for the A/E's filing convenience.

E. Submit six (6) copies of all Shop Drawings and Brochures for review and approval. One set will be retained by the Engineer, one set by the Architect for record purposes.

F. Minimum size of submittal data shall be 8-1/2" x 11".

G. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Architect reserved the right to require the Contractor to furnish items exactly as described in the Contract Documents.

H. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they are not equal. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contractor is not able to furnish an acceptable alternate until the
proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Architect and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Architect based on the particular circumstances.

1.10 SUBSTITUTIONS

A. The listing of product manufacturers, catalog numbers, etc., in the various sections of the specifications is intended to establish a standard of quality only, and is not intended to preclude open, competitive bidding. The Contractor may at his option submit substitute materials or methods which he feels are equal or superior to those specified. If the Contractor does submit alternate materials or methods, it shall be understood that the Contractor:

1. Has personally investigated the proposed substitute product and determined that it has all the same accessories and is equal or superior in all respects to the item specified.

2. Will provide the same guarantee for the substitution that he would for that specified.

3. Has coordinated the installation of the equipment which he proposes to substitute with all other trades especially in regard to electrical requirements and to operating weights trades and includes the costs for any changes required for the work to be complete in all respects. The Contractor will prepare shop drawings where required by the Architect or where dimensions vary.

4. Waives any and all claims for additional costs related to the substitution.

1.11 SPARE PARTS DATA

A. As soon as practicable after approval of materials and equipment, and, if possible, not later that one months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and sources of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the contract. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee specified.

1.12 RECORD DRAWINGS

A. The Contractor shall keep a set of Drawings of the job, noting daily all changes made in the Drawings in connection with the final installation including exact
dimensioned locations of all new and uncovered existing active and inactive utilities outside the building and shall turn over a clean, neatly marked set of sepias reproducible Drawings showing "as-built" work to the A/E for delivery to the Owner. All underground utilities and services and systems shall be accurately located by the Contractor and dimensioned on the "as-built" Drawings.

1.13 OPERATING AND MAINTENANCE MANUAL

A. Prepare and submit to the Architect for delivery to the Owner an indexed manual with complete technical data for every piece of equipment and material installed under this contract.

1. Complete submittals as approved by Architect.
2. Manufacturer's installation instruction brochures.
3. Manufacturer's local representative and/or Distributor's name, address and phone number.
4. Manufacturer's operating and maintenance brochures.
5. Replacement part number listings and/or descriptions.
7. Valve tag list.

B. This manual shall include all of the listed data bound into a permanent hard-back binder identified on the cover as "Operating and Maintenance Manual" with additional cover display of the names and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Sub-Contractors installing equipment represented in the brochure.

C. Contents of the Manual shall be grouped in sections according to the various sections of the specifications and shall be listed in a Table of Contents.

PART 2 PRODUCTS

2.1 STANDARDS FOR MATERIALS

A. All materials, in general, shall conform to the requirements of all agencies of publications hereinbefore specified under the paragraph QUALITY ASSURANCE and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials
or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized testing agency indicating that the items have been tested in accordance with required procedures, and that the materials and equipment comply with all contract requirements.

2.2 STANDARD PRODUCTS

A. Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

2.3 MANUFACTURERS INSTRUCTIONS

A. The responsibility for the furnishing of the proper equipment and/or material and the responsibility for seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor. If needed for proper installation, operation, or startup, the Contractor shall request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers’ published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the contract documents and the manufacturers’ directions and shall obtain the Architect’s instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturers’ directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.

2.4 RUST PREVENTION

A. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.5 STORAGE ON SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is a suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

2.6 CAPACITIES
A. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.

2.7 NAMEPLATES

A. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of final inspection.

2.8 CONDITION OF MATERIAL AND APPURTENANCES

A. All pipe, fittings, appurtenances, and other material required for complete installation of these systems shall be new to conform to manufacturer's recommendations, unless otherwise specified. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of substantial completion, shall be replaced by the Contractor without extra cost to Owner.

PART 3 EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of system. No union will be required in welded lines or lines assembled with solder joint fittings, except at equipment items, machinery items, and other special pieces or apparatus. Companion flanges on lines at various items of equipment, machines and pieces of apparatus, shall serve as unions to permit removal of the particular items. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.

3.2 SPACE AND EQUIPMENT ARRANGEMENT

A. All equipment shall be installed in a manner to permit access to parts requiring service without disassembly of other equipment.

B. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly protected against damage.
3.3 PRECEDENCE OF WORK

A. This contract includes many different systems furnished and installed by different trades. Each trade shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping any other trades.

3.4 EXCAVATION AND BACKFILL

A. The Contractor shall perform all excavation of every description required in the execution of his work. Excavation shall be through whatever substance encountered, to the depths indicated on the drawings, or as required. Excavated material suitable for backfill shall be piled in an orderly manner a sufficient distance from the trench to prevent overloading sides and causing cave-ins. Excavated materials not suitable for backfill shall be removed or stored as directed. Such grading shall be done as is necessary to protect the excavation from surface water. Trenches shall be maintained in a dry condition by bailing, pumping, or other approved methods. Pipe shall not be laid in wet trenches. Sheeteting and shoring shall be provided as required for the protection of the work and the safety of personnel.

B. Trenches shall be of the necessary width and depth to provide for proper laying of pipe and appurtenances, with banks as nearly vertical as possible. Bottoms of trenches shall be excavated to the grade and depth indicated or required, and barrel of pipe shall be laid on firm and undisturbed soil. Bell holes, of a size to permit proper grading, shall be provided as required. Over-depth excavations shall be backfilled to proper level with sand. When rock or other soil not suitable for bedding the pipe is encountered, it shall be removed to a depth of not less than 1' below grade, and backfilled with sand to grade, to provide a suitable bed for pipe. Existing underground piping shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired to the Architect's satisfaction, at the Contractor's expense.

C. Trenches shall not be backfilled until all required tests have been performed. This requirement does not preclude sectional testing and backfilling of the various systems. Trenches shall be carefully backfilled with a minimum 6” sand cover over piping then backfilled with material (free from large earth clods, rocks, and/or foreign materials), laid in 6” layers, compacted to 90 percent of maximum dry density as determined by ASTM D698 (compaction shall be to 95 percent below structures, including sidewalks and roadways).

D. Open trenches abutting foundation or basement excavations, building walls, and grade beams, will not be permitted, but shall be backfilled and completed, for as distance of not less than 10’ from the above features, as soon as possible. All
damage resulting from flooding due to open trenches shall be paid for by the Contractor.

E. Where excavation requires, existing walks, street, drives, or other existing pavement shall be cut to install new lines and to make new connections to existing lines. The size of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new materials is completed and the excavation has been backfilled, the paving shall be patched, using materials to match those cut out. The patches shall be thoroughly bound with the original surfaces, and shall be level with them.

3.5 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to permit installation of any work under this section of the specifications or to repair any defects that may appear, up to the expiration of the guarantee period, such cutting shall be done under the observation of the Architect by the Contractor. The Contractor shall not be permitted to cut or modify any structural members without the written direction of the Architect.

B. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades occasioned by the cutting operations, or occasioned by the failure of any part of work installed under this contract, shall be performed by the trade whose work is involved, but shall be paid for by the Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.

3.6 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide his own hoisting facilities to set his materials and equipment in place in the building, as indicated on drawings and for subsequent cleaning, testing, and adjusting.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to the job, in accordance with intent of these documents.

3.7 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the project site.
B. At completion of the job, the Contractor shall remove all of his tools, scaffolding, and surplus materials. He shall leave the area "broom clean."

3.8 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Unless specifically shown, indicated, or specified to the contrary, each item shown or required by the Mechanical Drawings or specified in the Mechanical Specifications shall be accompanied by all motors and starting and controlling equipment necessary for the items' proper operations. These motors shall be integrally attached to and/or installed with their associated equipment item and electrically connected as specified in Division 16 - Electrical. Equipment controlled from motor control centers shall be supplied with motors only. Motor control centers are specified in the Electrical Specifications and shown on the Electrical Drawings.

END OF SECTION
SECTION 220523 - VALVES FOR PLUMBING

PART 1   GENERAL

1.01 WORK INCLUDED

A. Gate Valves
B. Ball Valves
C. Check Valves
D. Butterfly Valves
E. Balancing Valves

1.02 RELATED WORK

A. Section 220500 – Common Work Results For Plumbing
B. Section 221116 – Plumbing Piping

1.03 SHOP DRAWINGS

A. Submit product data in accordance with Section 220500 Common Work Results For Plumbing.

PART 2   PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Valves as manufactured by KITZ, Nibco, Crane, Apollo, Watts or approved equal are acceptable provided they meet or exceed these specifications.

B. Provide valve types of same manufacturer throughout where possible.

C. Provide valves with manufacturer’s name and pressure rating clearly marked on outside of body.

D. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by installer to comply with installation requirements. Provide 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. Valves shall be of same make for all these services.
2.02 VALVE CONNECTIONS

A. Provide valves suitable for connection to adjoining piping as specified for pipe joints. Use pipe size valves unless otherwise indicated.

B. Provide threaded valves for pipe sizes 2 inches and smaller.

C. Provide flanged valves for pipe sizes 2 1/2 inches and larger.

D. Solder or screw to solder adaptors for copper tubing.

E. Use valve body suitable for mechanical coupling jointed piping.

F. Provide butterfly valves with full tapped lug bodies.

2.03 GATE VALVES

A. Select valves, equipped with packing suitable for intended service. (Under no circumstances is asbestos acceptable) Select valves designed so back seating protects packing and stem threads from media when valve is fully opened, and equipped with gland follower. Guides for disc on rising stem valves must be machined for accurate fit.

B. Comply with the following standards:

   Cast Iron Valves: MSS SP - 70
   Bronze Valves: MSS SP - 80

C. Threaded ends 2" and smaller: Class 125, bronze body, screwed bonnet, rising stem, solid wedge: Kitz #44, Nibco T-111, Crane 428 or equal. (Non-rising gate valves may be used where headroom prevents full extension of rising stems: Kitz #40, Nibco T-113, Crane 438 or equal)

D. Solder ends 2" and smaller: Class 125, bronze body, screwed bonnet, rising stem, solid wedge: Kitz #44, Nibco S-111, Crane 428 or equal. (Non-rising stem gate valves may be used where headroom prevents full extension of rising stems: Kitz #41, Nibco S-113, Crane 438 or equal)

E. Flanged ends 2" and larger: Class 125 iron body, bronze mounted, bolted bonnet, rising stem, OS&Y, solid wedge: Kitz #72, Nibco F617-0, Crane 465-1/2 or equal.
2.04 BALL VALVES

A. Select with full port opening, blow-out proof stem, hard chrome plated forged brass vented ball, adjustable packaging nut, rated not less than 600# W.O.G., 150 W.S.P.

B. Comply with the following standards:

Ball Valves: MSS SP - 110

C. Domestic Water Service

1. Threaded ends 3" and smaller: 600# W.O.G., 150 W.S.P., bronze two piece body, hard chrome plated full port forged brass ball, true adjustable packing nut, blow-out proof stem: Kitz #68, Nibco T-585-70, Apollo 77-100 Series, Watts 6080 or equal.

2. Solder ends 3" and smaller: 600# W.O.G., 150 W.S.P., bronze two piece body, hard chrome plated full port forged brass ball, true adjustable packing nut, blow-out proof stem: Kitz #69, Nibco T-585-70, Apollo 77-200 Series, Watts B-6081 or equal.

D. Natural Gas Service

1. Threaded ends 2" and smaller: 175# W.O.G., bronze two piece body, hard chrome plated full port forged brass ball, true adjustable packing nut, blow-out proof stem, U.L. listed for natural gas service: Kitz #60, Nibco GB, Watts GBV or equal.

2.05 BUTTERFLY VALVES

A. Where butterfly valves are used as shut-off for termination, or equipment removal or repair, select ductile iron lug type valves, bi-directional, dead-end service rated to the full working pressure of the valve. Provide gear operators on butterfly valves 8" and larger. Valve bodies to have extended necks to provide for 2-1/2" insulation as needed. Butterfly valves 12 inch and smaller rated to 200 psi, 14 inch and larger to 150 psi.

B. Comply with the following standards:

Butterfly Valves: MSS SP - 67

C. Lug type 2" and larger: Ductile iron body, lever operated, 10-position throttling handle 2-6 inch, 8 inch and larger gear operated, bronze disc, type 400 Series
stainless steel stem, EPDM seat. Butterfly valves 12 inch and smaller rated to 200 psi, 14 inch and larger 150 psi.

D. Manufacturer subject to compliance with requirements, provide butterfly valves with one of the following: Kitz #6122E (Lug type), Milwaukee, ML233E (Lug), Nibco LD2000 (Lug) or equal.

2.06 SWING CHECK VALVES

A. Comply with the following standards for design, workmanship, material and testing:

   Bronze Valves: MSS SP - 80
   Cast Iron Valves: MSS SP - 71

B. Construct valves of pressure casting free of any impregnating materials

C. Threaded ends 2" and smaller: Class 125, bronze body, screwed cap, "Y" pattern swing, bronze disc: Kitz #22, Nibco T-413B, Crane 37 or equal.

D. Soldered ends 2" and smaller: Class 125, bronze body, screwed cap, "Y" pattern swing, bronze disc: Kitz #23, Nibco T-413B, Crane 1342 or equal.

E. Flanged ends 2-1/2" and larger: Class 125, iron body, bronze mounted, horizontal swing, cast-iron disc: Kitz #78, Nibco F918-B, Crane 373 or equal.

2.07 BALANCING VALVES

A. Manual Balance Valve: Furnish and install as shown on plans, a calibrated (bronze/cast iron with bronze disc) balance valve equipped with readout valves to facilitate the connecting of a differential pressure meter. Each readout valve shall be fitted with an integral check valve designed to minimize system fluid loss during the monitoring process. The balancing valve shall have an indexing pointer and calibrated nameplate to indicate the degree of closure of the precision machined orifice. Each balancing valve is to be constructed with internal O-ring seals to prevent leakage around the rotating element. The balancing valves shall be supplied with performed polyurethane insulation, suitable for use on heating and cooling system.

2.08 VALVE FEATURES

A. Provide valves with features indicated and where not otherwise indicated, provide proper valve features as outlined in this specification. Comply with ANSI B31.1.

C. Threaded valve ends comply with ANSI B2.1.

D. Solder Joint valve ends complying with ANSI B16.18.

E. Fabricate pressure-containing components of valves, including stems and seats from brass or bronze materials; of standard alloy recognized in valve manufacturing that resist de-zincification.

F. Butterfly valve designed for flow regulation and manufactured to be tight in closed position. Test pressures in accordance with MSS SP-67 as follows: Seat 2-12" 220 psi. No leakage permitted under test.

2.09 VALVE OPERATORS

A. Provide suitable handwheels for gate, globe and butterfly valves.

B. For butterfly valves provide gear operators for sizes 8 inches and larger. For smaller sizes provide lever lock handle with toothed plate for shut-off service and infinitely adjustable handle with lock nut and memory stop for throttling service.

C. Provide valves located more than 7 feet from floor in equipment room areas with chain wheel operators. Extend chains to about 5 feet above floor and hook to clips arranged to clear walking aisles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install ball valves for shut-off and isolating service, to isolate equipment, part of systems, or vertical risers.

C. Install globe valves for throttling service and control device or meter by-pass.

D. Provide shut-off valves and check valves on discharge of pumps.

E. Install check valves in horizontal position with pin horizontally perpendicular to center line of pipe. Install for proper direction of flow. Installations on any vertical piping must be up flow only.

F. Valves used for natural gas shall be listed for such use.

G. All valves shall be located so that the bonnets can be removed.
H. Where valves are installed concealed in pipe chases provide Zurn Z-1460-4 or approved equal access doors with concealed hinge and key operated locks. Door shall be large enough to service valves and shall be installed flush with finished walls.

I. Install underground domestic water valves in pre-cast concrete valve box with a cast iron lid with "water" cast into lid.

J. Provide bass tag for each valve labeling the fluid in the pipe, the area served, and the normal operating position.

END OF SECTION
SECTION 220529 - SUPPORTS, ANCHORS AND SLEEVES FOR PLUMBING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Pipe Hangers and Supports

1.2 RELATED WORK

A. Section 220500 – Common Work Results For Plumbing

B. Section 221116 – Plumbing Piping

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 220500 Common Work Results For Plumbing.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall be as manufactured by Grinnell, Elcen, Fee and Mason, Unistrut or approved equal.

2.2 INSERTS

A. Malleable iron case of galvanized steel sheet and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.

B. Size inserts to suit threaded hanger rods.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers: Pipe sizes 1/2 inch to 1-1/2 inch: adjustable wrought steel ring.

B. Hangers: Pipe sizes 2 inches to 4 inches: adjustable wrought steel clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Vertical Support: Steel riser clamp.
E. Steel Beam Clamps: Elcen Figure 33, Type 3 or approved equal.

F. Expansion Anchors: Phillips Red Head or approved equal.

G. Design hangers to impede disengagement by movement of supported pipe.

H. Provide copper plated hangers and supports for copper piping or two layers Scotch 33 PVC tape or equal.

2.4 HANGER RODS

A. Provide cadmium plated steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

2.5 FLASHING

A. Steel Flashing: 24 gauge galvanized steel.

B. Lead Flashing: 5 lb./sq.ft. sheet lead for waterproofing.

C. Safes: 5 lb./sq. ft. sheet lead or 8 mil thick neoprene.

D. Caps: Steel, 22 gauge minimum, 16 gauge at fire resistance structures.

2.6 SLEEVES

A. Pipes through Walls, Fire Proofing, Footings, Potentially Wet Floor: Form with galvanized steel pipe.

B. Size large enough to allow for movement due to expansion and to provide for continuous installation.

PART 3 EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

A. All structures and appurtenances employed for the purpose of supporting the pipe and guiding it properly shall be carefully fabricated in such a manner as to preserve the true grade of the pipe without subjecting either the pipe or the supporting and guidance members to any undue strain.

B. Support horizontal piping as follows:
C. Space hangers and furnish rods as follows:

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<th>Nominal Pipe Size (in.)</th>
<th>Span (ft.)</th>
<th>Hanger Rod Diameter (in.)</th>
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D. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work.

E. Place a hanger within one foot of each horizontal elbow.

F. Use hangers which are vertically adjustable 1-1/2 inch maximum after piping is erected.

G. Support piping at each change or direction, at ends of branches, at base and top of riser pipes and drops, and wherever necessary to prevent sag, bending or vibration, in addition to above-listed hanger spacing.

H. Pipe hangers on insulated lines shall be sized to fit the outside of the insulation.

I. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers, designed to support loads per ANSI B31.1.

J. Where practical, support riser piping independently of connected horizontal piping.

3.2 EQUIPMENT BASES AND SUPPORTS

A. Provide for major equipment minimum four inch thick reinforced concrete house-keeping bases poured directly on structural floor slab pinned in place and extended 6 inches minimum beyond machinery bedplates. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment. Coordinate with other trades.

B. Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
C. Provide rigid anchors to ducts and pipes immediately after vibration connections to equipment.

3.3 PRIMING

A. Prime coat non-galvanized steel hangers and supports.

3.4 FLASHING

A. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inch minimum clear on sides with minimum 24 inch x 24 inch sheet size. For pipes through outside walls, turn flange back into wall and caulk.

B. Flash floor drains over finished areas with lead 10 inch clear on sides with minimum 36 inch x 36 inch sheet size. Fasten flashing to drain clamp device.

3.5 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through potentially wet floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.

C. Where piping passes through floor, ceiling or wall close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

D. Install chrome plated escutcheons where piping passes through finished surfaces.

E. Size pipe sleeves to permit placing pipe and specified insulation material for pipes passing through concrete or masonry walls or concrete slabs.

F. Sleeves for pipes through floor slabs standard weight galvanized steel pipe with top of sleeve projecting 2 inches above finished floor. For waterproof sleeves.

G. Sleeves for pipe through walls standard weight galvanized steel pipe or 18-gauge galvanized sheet metal with ends flush with wall surface.

H. Seal pipes passing through walls or slabs. Use mastic or oakum seal in the annular space in non-fire-rated walls; use Dow-Corning 3-6548 silicone RTV foam firestop sealant or equal in the annular space in fire-rated walls or other envelopes.
I. Seal exposed pipe passing through floor slabs with Dow-corning 3-6548 silicone RTV foam firestop sealant or equal and point with caulking compound. Strike off flush at top of sleeve.

J. Insulated pipe shall be insulated in sleeves, caulked and pointed as above.

K. Sleeves penetrating exterior walls below grade shall be standard weight, black steel pipe with 1/4” thick steel plate secured to the pipe with a continuous fillet weld. The plate shall be located in the middle of the wall and shall be 4” wider all around than the sleeve it encircles. The entire assembly shall be hot dipped galvanized after fabrication. The pipe passing through the sleeve shall be centered within the sleeve and the annulus opening sealed with "Link Seal" casing seals manufactured by Thunderline Corporation, Wayne, Michigan. Series 300 for pipe sizes 1/2” through 10" and series 400 or 500 for larger pipe sizes or equal.

L. Pipe sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided for roof penetrations.

M. All piping shall be installed with due regard to expansion and contraction. Type of hanger, methods of support, location of supports, etc., shall be governed in part by this consideration.

END OF SECTION
SECTION 220700 - PLUMBING INSULATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Insulation of Domestic Hot Water Piping

1.2 RELATED WORK

A. Section 220500 – Common Work Results For Plumbing

B. Section 221116 – Plumbing Piping

1.3 QUALITY ASSURANCE

A. All insulation materials required for piping, and mechanical equipment, etc. shall be furnished and installed under this contract. The execution of the work shall be by approved insulation contractor in strict accordance with the best practice of the trade and the intent of this Specification.

B. It is mandatory that all insulation be applied in a neat and workmanlike manner. Contractor shall be required to remove and replace all insulation not applied in strict accordance with manufacturer's specifications or not presenting a neat finished appearance.

C. All insulation on indoor work shall have composite (insulation, jacket or facing, and adhesive used to adhere jacket or facing to the insulation) fire and smoke hazard Ratings, as tested by procedure ASTM E-84, NFPA 255 and UL 73 not exceeding Flame Spread of 25, Fuel Contributed of 50 and Smoke Developed of 50. Accessories, such as adhesives, mastics, cements, tapes and cloths for fittings shall have component ratings as listed above.

D. Insulation shall be continuous through wall, floor and ceiling openings and sleeves.

E. Specified mastics, adhesives and coatings shall be applied in strict accordance with manufacturer's instructions, including recommended coverages.

1.4 SUBMITTALS

A. Submit materials and installation instructions in accordance with Section 220500.
PART 2  PRODUCTS

2.1  ACCEPTABLE MANUFACTURERS

A. Products manufactured by Owens-Corning, Knauf, Johns Manville, Certain-Teed, Govain, Benjamin Foster are acceptable provided they meet or exceed these specifications.

2.2  PIPING

A. Piping:

1. Insulation thickness - Fiberglass pipe covering.

<table>
<thead>
<tr>
<th>PIPING TYPE</th>
<th>PIPE SIZE</th>
<th>INSULATION SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Hot Water Supply &amp; Return</td>
<td>2&quot; &amp; under</td>
<td>1&quot;</td>
</tr>
<tr>
<td></td>
<td>2-1/2&quot; &amp; up</td>
<td>1-1/2&quot;</td>
</tr>
</tbody>
</table>

2. All fiberglass pipe insulation shall be nominal 5 pcf density.

3. Insulation jacket shall be factory applied white All Service Jacket (ASJ), with factory supplied self-sealing laps.

4. Fittings, Valves and Flanges:

a. Where manufactured, factory premolded fittings (of the same material and thickness as the pipe insulation) shall be used for all fittings, flanges and valves.

b. Where premolded insulation fittings are not manufactured, all fittings, flanges and valves shall be insulated with mitered segments of nominal 5 lb. density fiberglass pipe covering. Hot Service Finish: embed a 20 x 20 weave white glass reinforcing cloth between two 1/16 inch coats of Benjamin Foster 30-36. The glass cloth and second coat shall overlap adjacent covering by at least two inches. Cold Service Finish: same as above except use Benjamin Foster 30-35.

c. Insulation for removable flanges of pipe strainers shall be fabricated with built-up sections of Fiberglass pipe covering, so arranged as to facilitate servicing of the strainer. Applications for cold services shall be complete with vapor seals.
5. Insulation on pipes shall be protected by saddles from hangers, guides, and rollers.

PART 3  EXECUTION

3.1 PREPARATION

A. Do not install covering before piping and equipment has been tested and approved.

B. Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.

3.2 INSTALLATION

A. Ensure insulation is continuous through inside walls. Pack around pipes with fire proof self-supporting insulation material, fully sealed.

B. Insulate fittings and valves. Do not insulate unions, flanges, strainers, flexible connections and expansion joints. Terminate insulation neatly with plastic material troweled on bevel.

C. Finish insulation neatly at hangers, supports and other protrusions.

D. Locate insulation cover seams in least visible locations.

E. Cold Piping: Cover fittings and valves with equivalent thickness of insulation material. Cover with open mesh glass cloth sealed with vapor barrier sealant. Seal lap joints with 100% coverage of vapor barrier sealant and adhesive. Seal butt joints with 4 inches wide strips of vapor barrier sealed with vapor barrier adhesive. For exposed fittings and valves, apply hydraulic setting cement paste over insulation material before applying canvas jacket.

F. Hot Piping: Cover fittings and valves with equivalent thickness of insulation material. For exposed fittings and valves apply hydraulic setting cement paste over insulating material before applying canvas jacket.

J. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

END OF SECTION
SECTION 221116 - PLUMBING PIPING

PART 1   GENERAL

1.1 WORK INCLUDED
A. Sanitary Sewer Piping System
B. Domestic Water Piping System

1.2 RELATED WORK
A. Section 220500 – Common Work Results For Plumbing
B. Section 220523 – Valves For Plumbing
C. Section 220529 – Supports, Anchors and Sleeves For Plumbing
D. Section 221116 – Plumbing Piping Insulation
E. Section 221119 – Plumbing Specialties
F. Section 224000 – Plumbing Fixtures

1.3 REFERENCES
A. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
B. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder. Joint Drainage Fittings - DWV.
C. ANSI/ASTM B32 - Solder Metal.
D. ASTM A74 - Cast Iron Soil Pipe and Fittings.
E. ASTM B88 - Seamless Copper Water Tube.
F. ASTM B306 - Copper Drainage Tube (DWV).
H. AWS 5.8 - Brazing Filler Metal.
1.4 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.5 SUBMITTALS

A. Submit product data in accordance with Section 220500.

B. Include data on pipe materials, pipe fittings, and accessories.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING


2.2 SANITARY SEWER PIPING, ABOVE GRADE


2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tubing: ASTM B88, Type K, annealed. Fittings: NONE. Joints: NONE.


2.4 WATER PIPING, ABOVE GRADE

PART 3  EXECUTION

3.1  PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.2  INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
B. Route piping in orderly manner and maintain gradient.
C. Install piping to conserve building space and not interfere with use of space.
D. Group piping whenever practical at common elevations.
E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
F. Provide clearance for installation of insulation and access to valves and fittings.
G. Provide access doors to match wall or ceiling construction where valves and fittings are not exposed.
H. Slope water piping and arrange to drain at low points.
I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting where exposed.
K. Establish invert elevations, slopes for drainage to \([1/4]\) inch per foot ([2] percent) minimum for sanitary sewer piping.
L. Install bell and spigot pipe with bell end upstream.
3.3 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and analyze in accordance with AWWA C601.

I. Submit statement of test results and procedures to Architect.

3.5 FLUSHING OF DOMESTIC WATER PIPING SYSTEM

A. Prior to start of work, verify system has been disinfected per paragraph 3.04 of this section.

B. All installed plumbing fixtures shall be rinsed (ran) daily for a minimum of 30 seconds each. This shall continue for a minimum period of two (2) weeks.

C. At the conclusion of the flushing cycle, verification samples may be collected by a school representative for testing.
D. If the testing proves that the lead content is in excess of allowable levels, an additional two (2) week flushing period may be required.

E. Records of flushing must be maintained and available for inspection.

3.6 TESTING

A. Test soil and vent systems by plugging lines and filling systems with water to a static head of ten (10) feet of water. Observe water level for two (2) hours. If level is lowered, indicating leakage, repair leaks and test again until no further leakage is detected.

B. Test water piping at 100 psig for a continuous period of four (4) hours. During this time, carefully inspect the system for leaks. If necessary, repair leaks and test again until no further leakage is detected.

END OF SECTION
SECTION 221119 - PLUMBING SPECIALTIES

PART 1   GENERAL

1.1 WORK INCLUDED
   A. Cleanouts
   B. Water Hammer Arrestors

1.2 RELATED WORK
   A. Section 220500 – Common Work Results For Plumbing
   B. Section 220529 – Supports, Anchors and Sleeves For Plumbing
   C. Section 221116 – Plumbing Piping
   D. Section 224000 – Plumbing Fixtures

1.3 REFERENCES
   A. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
   B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
   C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
   E. ANSI A112.21.1 - Floor Drains.
   G. PDI WH-201 Water Hammer Arrestors.

1.4 QUALITY ASSURANCE
   A. Manufacturer: For each type of product specified, provide components by same manufacturer throughout.

1.5 SUBMITTALS
   A. Submit shop drawings and product data in accordance with Section 220500.
B. Include component sizes, rough-in requirements, service sizes, and finishes.

PART 2  PRODUCTS

2.1  FLOOR DRAINS

A. Manufacturers: Josam, J.R. Smith, Watts, Zurn or approved equal meeting these specifications are acceptable.

2.2  FLOOR SINKS

A. Manufacturers: Josam, J.R. Smith, Watts, Zurn or approved equal meeting these specifications are acceptable.

2.3  CLEANOUTS

A. Manufacturers: Josam, J.R. Smith, Wade, Watts, Zurn or approved equal meeting these specifications are acceptable.

B. Exterior Surfaced Areas: Round coated cast iron body with cast iron non-skid cover and plug; Model 4225 manufactured by J.R. Smith.

C. Exterior Unsurfaced Areas: Line type with coated cast iron body and round gasketed cover; Model 4255 manufactured by J.R. Smith.

D. Interior Finished Floor Areas: Coated cast iron body with round nickel bronze scoriated cover; Model 4020 manufactured by J.R. Smith.

E. Interior Finished Wall Areas: Line type with coated cast iron body and cast iron lead seal plug, and round stainless steel access cover secured with machine screw; Model 4402 manufactured by J.R. Smith.

F. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4  WATER HAMMER ARRESTORS

A. Manufacturers: Josam, J.R. Smith, Wade, Watts, Zurn, or approved equal meeting these specifications are acceptable.

B. ANSI A112.26.1; Sized in accordance with PDI WH-201, precharged suitable for operation in temperature range - 100 to 300 degrees F and maximum 250 psig working pressure; Model 5000 Series manufactured by J.R. Smith. Sized on drawings using P.D.I. symbols.
PART 3 EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer’s instructions to permit intended performance.

B. 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.

C. Install water hammer arrestors complete with access door and isolation valve.

D. Provide backflow preventer at connection of domestic potable water system to any component which might lead to contamination of the water system.

END OF SECTION
SECTION 224000 - PLUMBING FIXTURES

PART 1   GENERAL

1.1 WORK INCLUDED

A. Water Closets
B. Urinals
C. Lavatories
D. Sinks
E. Service Sinks
F. Showers
G. Drinking Fountains

1.2 RELATED WORK

A. Section 220000 – Common Work Results For Plumbing
B. Section 220529 – Supports, Anchors and Sleeves For Plumbing
C. Section 221119 – Plumbing Specialties

1.3 REFERENCES

A. ANSI A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
D. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
F. ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

I. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

1.4 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each type of product specified throughout.

B. Trim: By same manufacturer for each type of product specified throughout.

C. Determine that intended fixtures fit the available space with adequate service clearance, prior to submittal.

1.5 SUBMITTALS

A. Submit product data in accordance with Section 220500.

B. Include fixtures, sizes, [rough-in dimensions], utility sizes, trim, and finishes.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data in accordance with Section 220500.

B. Include fixture trim exploded view and replacement parts lists.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIXTURES

A. Products manufactured by American Standard, Crane, Eljer, Elkay, Just, Kohler, ProFlo, Zurn or approved equal meeting these specifications are acceptable.

2.2 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

A. Products manufactured by American Standard, Bradley, Chicago Faucet, Delta, Eljer, Moen, Royal Brass, Symmons, Kohler, Waterless, Sloan, T&S Brass, CHG Brass, or approved equal meeting these specifications are acceptable.

2.3 ACCEPTABLE MANUFACTURERS - P-TRAP, STOP & SUPPLIES INSULATION

A. Products manufactured by McGuire, Plumberex, Truebro or approved equal meeting these specifications are acceptable.
2.4 ACCEPTABLE MANUFACTURERS - FLUSH VALVES
   A. Products manufactured by Sloan, Delany, or approved equal meeting these specifications are acceptable.

2.5 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS
   A. Products manufactured by Beneke, Church, Olsonite, ProFlo or approved equal meeting these specifications are acceptable.

2.6 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS
   A. Products manufactured by Josam, J. R. Smith, Zurn, Wade, Watts or approved equal meeting these specifications are acceptable.

2.7 ACCEPTABLE MANUFACTURERS - MIXING VALVES (THERMOSTATIC)
   A. Products manufactured by Leonard, Symmons, Bradley, Chicago, Sloan, Powers or approved equal meeting these specifications are acceptable.

2.8 ACCEPTABLE MANUFACTURERS - MIXING VALVES (PRESSURE BALANCED)
   A. Products manufactured by Leonard, Powers, Symmons, or approved equal meeting these specifications are acceptable.

2.9 ACCEPTABLE MANUFACTURERS - WASH FOUNTAINS
   A. Products manufactured by Acorn, Bradley, or approved equal meeting these specifications are acceptable.

2.10 ACCEPTABLE MANUFACTURERS - ELECTRIC WATER COOLERS
   A. Products manufactured by Elkay, Haws, Oasis, Sunroc, or approved equal meeting these specifications are acceptable.

PART 3 EXECUTION

3.1 INSPECTION
   A. Review millwork shop drawings and architectural drawings. Confirm location and size of fixtures and openings before rough-in and installation.

   B. Verify adjacent construction is ready to receive rough-in work of this Section.
3.2 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key and/or screwdriver stops reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and/or wall carriers and bolts.

E. Mount fixtures to the heights provided on the architectural elevations and details. If no elevations are provided, the following heights above finished floor can be utilized:

Water Closet:
- Standard: 14 1/2 inches to top of bowl rim
- Handicapped: 17 1/4 inches to top of bowl rim

Urinal:
- Standard: 22 inches to top of bowl rim
- Handicapped: 19 inches to top of bowl rim

Lavatory:
- Standard: 31 inches to top of basin rim
- Handicapped: 32 inches to top of basin rim

Drinking Fountain:
- Standard: [30] [40] inches to top of basin rim
- Handicapped: 36 inches to top of basin rim

Water Closet Flush Valves:
- Standard: 11 inches min. above bowl rim
- Recessed: 10 inches min. above bowl rim

Shower Heads:
- Adult [male]: 69.5 inches to bottom of head
- Adult [female]: 64.5 inches to bottom of head
- Child: 58.5 inches to bottom of head

3.3 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
B. At completion clean plumbing fixtures and equipment.

END OF SECTION
SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 RELATED WORK

A. General Conditions

B. Special Conditions

C. Supplementary General Conditions

D. Architectural, Structural, Civil, Electrical and Mechanical Drawings & Specifications

1.2 SCOPE OF WORK

A. The work covered by the Mechanical and Plumbing Sections of the Specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, inspections, utilities and incidentals necessary for the complete installation of all mechanical and plumbing work required in the Contract Drawings.

B. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction is required for work indicated or specified in this Section or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

C. The Contractor shall visit the premises and thoroughly familiarize himself with all the details of the work and working conditions and to verify all dimensions in the field. The Contractor shall advise the Architect of any discrepancy prior to bidding. The submission of bids shall be deemed evidence of the Contractor's site visit, the coordination of all existing conditions, and the inclusion of all considerations for existing conditions.

1.3 PLANS AND SPECIFICATIONS

A. These Specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.

B. If departures from the drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Architect
for review. No departures shall be made without prior written acceptance of the Architect.

C. The interrelation of the specifications, the drawings, and the schedules is generally as follows: The specifications determine the nature and setting of the materials, the drawings establish the quantities, dimensions, and details, and the schedules give the performance characteristics.

D. Should the drawings disagree in themselves or with the specifications, the contractor shall immediately notify the architect and shall perform and/or furnish the better quality or greater quantity of work or materials unless otherwise directed by the architect in writing. In case the specifications should not fully agree with the schedules, the latter shall govern. Figures indicated on drawings govern scale measurements and large scale details govern small scale drawings. In case of disagreement between specifications and drawings, see Division I of these specifications for clarifications.

E. Items specifically mentioned in the specifications but not shown on the drawings and/or items shown on the drawings but not specifically mentioned in the specifications shall be installed by the Contractor under the appropriate section of work as if they were both specified and shown.

1.4 QUALITY ASSURANCE

A. All work shall comply with the applicable rules of the following:

1. 2012 International Building Code
2. 2012 International Mechanical Code
3. 2012 International Plumbing Code
4. 2012 International Fire Code
6. National Fire Protection Association Codes
7. State Fire Marshall
9. All applicable city, county, state, and federal rules, codes, and ordinances.
B. In any instance where these specifications call for materials for construction of a better quality or larger size than required by the codes, the provisions of these specifications shall take precedence. None of the terms or provisions of this specification shall be construed as waiving any rules, regulations, or requirements of these authorities. The codes shall govern in case of direct conflict between the codes and the Drawings.

1.5 SUPERVISION

A. A competent foreman or superintendent, initially approved by the Architect, shall be assigned to the project to receive instructions and to act for the Contractor. Once this superintendent has been approved, no change shall be made without approval of the Architect. Architect's authorized representative and/or owner's observer shall have the right to observe the work at any time. The Contractor shall have a representative present when his work is being observed, and he shall give assistance, as may be required, to the Architect's representative. Recommendations made by the observer shall be promptly carried out, and all unsatisfactory material and/or workmanship shall be replaced at once, to the satisfaction of the Architect.

1.6 GUARANTEE

A. The Contractor shall guarantee all materials and workmanship for a period of two (2) years after the final acceptance of work.

1.7 UTILITIES

A. The contract documents reflect the general location, size, and elevations of sewer line, location, size and pressure of water and other lines and manner of routing for all utilities known to be required on this project. It shall be the responsibility of the Contractor to visit the site, meet with the local utility companies in order to coordinate and confirm the exact requirements for each utility to provide a complete and operative system. The bid submitted by the Contractor shall include costs for all such utility company charges and/or fees.

1.8 BUILDING CONSTRUCTION AND LAYOUT OF WORK

A. It shall be the responsibility of the Contractor to consult the architectural and engineering drawings and details so as to thoroughly familiarize himself with the type and quality of construction to be provided on this project.

B. The Drawings are diagrammatic in character and cannot show every connection in detail or every pipe and duct in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall
coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases or above suspended ceilings, etc., in finished portions of the building, unless specifically noted or indicated to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required before concrete is poured. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted.

C. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building and will in all cases be subject to the approval of the Architect, and he reserves the right to make any reasonable changes in the locations indicated without additional cost.

1.9 SHOP DRAWINGS AND BROCHURES

A. After the Contract is awarded, but prior to proceeding with the Work, the Contractor shall obtain, check, certify, and submit complete Shop Drawings and Brochures from Manufacturers, Suppliers, Vendors, etc., for all materials and equipment specified herein. Submit Shop Drawings and Brochures in sufficient time so as not to impede the progress of work. At least two weeks will be required for the processing of Shop Drawings and Brochures in the Engineer's office, exclusive of transmittal time. This time shall be considered by the Contractor when scheduling submittal data.

B. The Engineer's review of Shop Drawings and Brochures shall not relieve the Contractor of the responsibility for dimensions, errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the Engineer's noting some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the submittal data review.

C. Each Shop Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: the Title of the Sheet or Brochure; name and location of the building; names of the Architect, Engineer, Contractor, Manufacturer, Supplier, Vendor, etc., the date of submittal; and the date of each correction and revision. So far as is practical, each Shop Drawing and/or Brochure shall bear a cross-reference note to the sheet number or numbers of the Contract Drawings and/or Specifications showing the same work. Shop Drawings and Brochures shall be prepared as follows:
I. Shop Drawings: Drawings shall be drawn to a scale that can be easily read and shall contain sufficient plans, elevations, sections, and isometrics to describe clearly the items in question. Drawings shall be prepared by skilled technicians experienced in this type of work. All piping, equipment layouts, ductwork and similar Shop Drawings shall be drawn to at least 1/4" = 1'0" scale.

2. Brochures: Brochures shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information to show that the equipment will fit into the allotted space. Brochures not compiled in the manner described below shall be returned for resubmittal.

3. Brochures submitted shall contain only information which is relevant to the particular equipment or materials to be furnished. Do not submit catalogs that describe several different items other than those items to be used unless all irrelevant information is marked out or relevant information is clearly marked.

D. The submittal format shall follow the Specifications format with a submittal required for each section of Division 15. Each major category of equipment such as fans or pumps or air devices being submitted under a separate cover letter. The first submittal shall be accompanied by a three-ring hard back binder for the A/E to use in retaining copies of the submittals. Copies of each submittal shall be three-hole punched and arranged (or folded if required) for the A/E's filing convenience. Provide one copy of updated TABLE OF CONTENTS and progressive-tabbed manila index sheets also for the A/E's filing convenience.

E. Submit six (6) copies of all Shop Drawings and Brochures for review and approval. One set will be retained by the Engineer, one set by the Architect for record purposes.

F. Minimum size of submittal data shall be 8-1/2" x 11".

G. Any submittal that is disapproved must be resubmitted within two (2) weeks following notification of such disapproval. If no satisfactory material is submitted within the two-week period, the Architect reserved the right to require the Contractor to furnish items exactly as described in the Contract Documents.

H. No allowances will be made for submittals which are not made in a timely fashion or which are turned down because they are not equal. Should delivery problems arise due to the above, affecting the completion time of the project, the Contractor will furnish and install acceptable alternates until the proper materials arrive and then replace the alternate materials with the approved materials, all at no cost to the Owner. If the Contractor is not able to furnish an acceptable alternate until the
proper materials arrive, he will assume all costs for furnishing and installing all alternates as directed by the Architect and/or will pay a suitable penalty for the inconvenience experienced by the Owner. This penalty will be set by the Architect based on the particular circumstances.

1.10 SUBSTITUTIONS

A. The listing of product manufacturers, catalog numbers, etc., in the various sections of the specifications is intended to establish a standard of quality only, and is not intended to preclude open, competitive bidding. The Contractor may at his option submit substitute materials or methods which he feels are equal or superior to those specified. If the Contractor does submit alternate materials or methods, it shall be understood that the Contractor:

1. Has personally investigated the proposed substitute product and determined that it has all the same accessories and is equal or superior in all respects to the item specified.

2. Will provide the same guarantee for the substitution that he would for that specified.

3. Has coordinated the installation of the equipment which he proposes to substitute with all other trades especially in regard to electrical requirements and to operating weights trades and includes the costs for any changes required for the work to be complete in all respects. The Contractor will prepare shop drawings where required by the Architect or where dimensions vary.

4. Waives any and all claims for additional costs related to the substitution.

1.11 SPARE PARTS DATA

A. As soon as practicable after approval of materials and equipment, and, if possible, not later that one months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and sources of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified hereinafter to be furnished as part of the contract. The foregoing shall not relieve the Contractor of any responsibilities under the guarantee specified.

1.12 RECORD DRAWINGS

A. The Contractor shall keep a set of Drawings of the job, noting daily all changes made in the Drawings in connection with the final installation including exact
dimensioned locations of all new and uncovered existing active and inactive utilities outside the building and shall turn over a clean, neatly marked set of sepia reproducible Drawings showing "as-built" work to the A/E for delivery to the Owner. All underground utilities and services and systems shall be accurately located by the Contractor and dimensioned on the "as-built" Drawings.

1.13 OPERATING AND MAINTENANCE MANUAL

A. Prepare and submit to the Architect for delivery to the Owner an indexed manual with complete technical data for every piece of equipment and material installed under this contract.

1. Complete mechanical submittals as approved by Architect.

2. Manufacturer's installation instruction brochures.

3. Manufacturer's local representative and/or Distributor's name, address and phone number.

4. Manufacturer's operating and maintenance brochures.

5. Manufacturer's internal wiring diagrams.

B. This manual shall include all of the listed data bound into a permanent hard-back binder identified on the cover as "Operating and Maintenance Manual" with additional cover display of the names and location of the Building, the Owner, the Architect, the Engineers, the General Contractor, and the Sub-Contractors installing equipment represented in the brochure.

C. Contents of the Manual shall be grouped in sections according to the various sections of the specifications and shall be listed in a Table of Contents.

PART 2 PRODUCTS

2.1 STANDARDS FOR MATERIALS

A. All materials, in general, shall conform to the requirements of all agencies of publications hereinbefore specified under the paragraph QUALITY ASSURANCE and shall be listed, inspected, and approved by the Underwriters Laboratories and shall bear the U.L. label where labeling service is available. The label or listing of the Underwriters Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor may submit a statement from a nationally recognized testing agency indicating that the items have been tested in accordance with required
procedures, and that the materials and equipment comply with all contract requirements.

2.2 STANDARD PRODUCTS

A. Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

2.3 MANUFACTURERS INSTRUCTIONS

A. The responsibility for the furnishing of the proper equipment and/or material and the responsibility for seeing that it is installed as intended by the manufacturer, rests entirely upon the Contractor. If needed for proper installation, operation, or startup, the Contractor shall request advice and supervisory assistance from the representative of the specific manufacturer. The manufacturers' published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the contract documents and the manufacturers' directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturers' directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.

2.4 RUST PREVENTION

A. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A123 or A153, except where other equivalent protective treatment is specifically approved in writing.

2.5 STORAGE ON SITE

A. The Contractor shall not receive material or equipment at the job site until ready for installation or until there is a suitable space provided to properly protect equipment from rust, weather, humidity, dust, or physical damage.

2.6 CAPACITIES

A. Capacities shall be not less than those indicated and shall be such that no component or system becomes inoperative or is damaged because of startup or other overload conditions.
2.7 NAMEPLATES

A. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of final inspection.

2.8 CONDITION OF MATERIAL AND APPURTENANCES

A. All pipe, fittings, appurtenances, and other material required for complete installation of these systems shall be new to conform to manufacturer's recommendations, unless otherwise specified. All equipment injured or damaged in transit from factory, during delivery to premises, while in storage on premises, while being erected and installed, and while being tested, until time of substantial completion, shall be replaced by the Contractor without extra cost to Owner.

PART 3 EXECUTION

3.1 INSTALLATION OF SYSTEMS

A. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of system. No union will be required in welded lines or lines assembled with solder joint fittings, except at equipment items, machinery items, and other special pieces or apparatus. Companion flanges on lines at various items of equipment, machines and pieces of apparatus, shall serve as unions to permit removal of the particular items. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.

3.2 SPACE AND EQUIPMENT ARRANGEMENT

A. All equipment shall be installed in a manner to permit access to parts requiring service without disassembly of other equipment.

B. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly protected against damage.

3.3 PRECEDENCE OF WORK

A. This contract includes many different systems furnished and installed by different trades. Each trade shall coordinate their work with that of all other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping any other trades.
3.4 CUTTING AND PATCHING

A. Where it becomes necessary to cut through any wall, floor, or ceiling to permit installation of any work under this section of the specifications or to repair any defects that may appear, up to the expiration of the guarantee period, such cutting shall be done under the observation of the Architect by the Contractor. The Contractor shall not be permitted to cut or modify any structural members without the written direction of the Architect.

B. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades occasioned by the cutting operations, or occasioned by the failure of any part of work installed under this contract, shall be performed by the trade whose work is involved, but shall be paid for by the Contractor.

C. Any openings cut through exterior walls or roofs shall be provided with suitable covers, while they are left open, to protect the property or materials involved. Any openings cut through walls below grade shall be properly protected to prevent entrance of water or other damaging elements.

3.5 HOISTING, SCAFFOLDING, AND TRANSPORTATION

A. The Contractor shall provide his own hoisting facilities to set his materials and equipment in place in the building, as indicated on drawings and for subsequent cleaning, testing, and adjusting.

B. The Contractor shall provide necessary transportation to facilitate the delivery of all materials, equipment, tools, and labor to the job, in accordance with intent of these documents.

3.6 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish caused by him, his employees, or his work. This debris shall be removed, not only from the building, but also from the project site.

B. At completion of the job, the Contractor shall remove all of his tools, scaffolding, and surplus materials. He shall leave the area "broom clean."

3.7 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. Unless specifically shown, indicated, or specified to the contrary, each item shown or required by the Mechanical Drawings or specified in the Mechanical Specifications shall be accompanied by all motors and starting and controlling equipment necessary for the items' proper operations. These motors shall be
integrally attached to and/or installed with their associated equipment item and electrically connected as specified in Division 16 - Electrical. Equipment controlled from motor control centers shall be supplied with motors only. Motor control centers are specified in the Electrical Specifications and shown on the Electrical Drawings.

END OF SECTION
SECTION 230529 – HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

PART 1 GENERAL

1.1 WORK INCLUDED
   A. Duct Hangers and Supports
   B. Flashing for Mechanical Equipment
   C. Sleevings for Mechanical Equipment

1.2 RELATED WORK
   A. Section 230500 – Common Work Results for HVAC
   B. Section 230529 - Supports, Anchors and Sleeves
   C. Section 233113 – Ductwork

1.3 SUBMITTALS
   A. Submit shop drawings in accordance with Section 230500.

1.4 REFERENCES
   A. Duct Hangers: SMACNA Duct Manuals.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
   A. Products shall be as manufactured by Grinnell, Elgen, Fee and Mason, Unistrut or approved equal.

2.2 INSERTS
   A. Malleable iron case of galvanized steel sheet and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
   B. Size inserts to suit threaded hanger rods.
2.3 DUCT HANGERS AND SUPPORTS

A. Hangers: Galvanized steel band iron or rolled angle and 3/8 inch rods.

B. Wall Supports: Galvanized steel band iron or fabricated angle bracket.

2.6 FLASHING

A. Steel Flashing: 24 gauge galvanized steel.

B. Lead Flashing: 5 lb./sq.ft. sheet lead for water proofing, one lb./sq.ft. sheet lead for sound proofing.

C. Safes: 5 lb./sq. ft. sheet lead or 8 mil thick neoprene.

D. Caps: Steel, 22 gauge minimum, 16 gauge at fire resistance structures.

2.7 SLEEVES

A. Pipes through Beams, Walls, Fire Proofing, Footings, Potentially Wet Floor: Form with galvanized steel pipe.

B. Round Ducts: Form with 18 gauge galvanized steel.

C. Rectangular Ducts: Form with 18 gauge galvanized steel.

D. Size large enough to allow for movement due to expansion and to provide for continuous installation.

PART 3 EXECUTION

3.1 INSERTS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inch or ducts over 60 inches wide.

C. Where concrete slabs form finished ceiling finish inserts, flush with slab surface.

3.2 LOW VELOCITY DUCT HANGERS AND SUPPORTS

A. Duct hangers and supports to be sized and spaced as per SMACNA requirements.
3.3  EQUIPMENT BASES AND SUPPORTS

A. Provide for major equipment minimum four inch thick reinforced concrete house-keeping bases poured directly on structural floor slab pinned in place and extended 6 inches minimum beyond machinery bedplates. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment. Coordinate with other trades.

B. Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

C. Provide rigid anchors to ducts and pipes immediately after vibration connections to equipment.

3.4  PRIMING

A. Prime coat non-galvanized steel hangers and supports.

3.5  FLASHING

A. Flash and counterflash where mechanical equipment passes through weather or water proofed walls, floor and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inch minimum clear on sides with minimum 24 inch x 24 inch sheet size. For pipes through outside walls, turn flange back into wall and caulk.

C. Flash floor drains over finished areas with lead 10 inch clear on sides with minimum 36 inch x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Provide curbs for mechanical roof installation 8 inch minimum high. Flash and counterflash with steel, soldered and waterproofed.

E. Provide lead flashing around ducts and pipes passing from equipment rooms, installed according to manufacturer’s data for sound control.

3.6  SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Extend sleeves through potentially wet floors 1 inch above finished floor level. Caulk sleeves full depth and provide floor plate.
C. Where piping or ductwork passes through floor, ceiling or wall close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

D. Install chrome plated escutcheons where piping passes through finished surfaces.

E. Provide pipe sleeves for all mechanical piping.

F. Size pipe sleeves to permit placing pipe and specified insulation material for pipes passing through concrete or masonry walls or concrete slabs.

G. Sleeves for pipes through floor slabs standard weight galvanized steel pipe with top of sleeve projecting 2 inches above finished floor. For waterproof sleeves.

H. Sleeves for pipe through walls standard weight galvanized steel pipe or 18-gauge galvanized sheet metal with ends flush with wall surface.

I. Seal pipes passing through walls or slabs. Use mastic or oakum seal in the annular space in non-fire-rated walls; use Dow-Corning 3-6548 silicone RTV foam firestop sealant or equal in the annular space in fire-rated walls or other envelopes.

J. Seal exposed pipe passing through floor slabs with Dow-corning 3-6548 silicone RTV foam firestop sealant or equal and point with caulking compound. Strike off flush at top of sleeve.

K. Insulated pipe shall be insulated in sleeves, caulked and pointed as above.

L. Pipe and duct sleeves, pitch pockets, and flashings compatible with the roofing installation shall be provided for roof penetrations.

M. All piping shall be installed with due regard to expansion and contraction. Type of hanger, methods of support, location of supports, etc., shall be governed in part by this consideration.

END OF SECTION
SECTION 230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 WORK INCLUDED

A. Testing, adjusting and balancing of the following systems:
   1. Air Distribution Systems
   2. Exhaust Systems

1.2 RELATED WORK

A. Section 230500 – Common Work Results for HVAC
B. Section 233423 – HVAC Power Ventilators
C. Section 233713 – Diffusers, Registers & Grilles

1.3 REFERENCED STANDARDS

A. Associated Air Balance Council, AABC National Standards.
C. Applicable SMACNA Standards.

1.4 QUALITY ASSURANCE

A. All work for the testing and balancing of the HVAC air distribution and hydronic systems shall be done by an independent Testing and Balancing firm that specializes in and whose business is limited to the testing and balancing of heating, ventilating and air conditioning systems.
B. If requested, the test shall be conducted in the presence of the Architect and/or the Owner.

C. The environmental systems including all equipment, apparatus and distribution systems shall be tested, adjusted and balanced in accordance with the latest edition of the AABC Procedural Standards for Testing, Adjusting and Balancing of Air Distribution and Hydronic Systems.

D. Instruments used in all HVAC systems and equipment tests shall be as recommended by the AABC, ASHRAE, NEBB, or as approved by the Architect. Test instruments used shall be initially and periodically checked thereafter to verify their calibration accuracy.

E. All test equipment shall be furnished by the Contractor and shall remain in his property. Any adapters such as "Pete's Plugs", pitot tube traverse connections, etc. shall be left in place and marked for future use.

1.5 SUBMITTALS

A. Submit test reports in accordance with Section 230500.

B. Specific procedures used in all tests shall be included in the test report. Contractor shall identify all equipment by the identification code as shown on the drawings.

C. Data shall be on printed forms published by either AABC, NEBB, or the Contractor.

D. The test report shall include as a minimum the following information and data:

1. Motors:
   Equipment number
   Manufacturer
   Model or serial number
   Frame size
   Rated horsepower
   Rate rpm
   Corrected full load amperage
   Measured amperage and voltage
   Calculated bhp
   Measured rpm
   Sheave size, type and manufacturer

2. Fans:
   Equipment number
   Manufacturer
   Model or serial number
Rated cfm
Rated rpm
Rated pressures
Measured cfm
Measured rpm
Measured pressures
Pulley size, type and manufacturer
Belt size and quantity

3. Diffuser, Registers and Grilles:
   System identification
   Grille number
   Grille or diffuser manufacturer
   Manufacturer's model number
   ADC flow factor
   Instrument to be used with ADC flow factor
   Grille size
   Design velocity
   Design cfm
   Final measured velocity
   Final measured cfm

E. All reports shall be certified by the Testing and Balancing Contractor that the methods used and the results achieved are as specified. In addition, each individual reporting form submitted must bear the signature and the Technician.

1.6 GUARANTEE

A. The test and balance firm shall include an extended warranty of 90 days, after the submittal of the test and balance report, during which time the Architect, at his discretion, may request a recheck or resetting of any outlet, supply air fan, exhaust fan, or any other item listed in the test report. The firm shall provide technicians to assist the Architect making any tests he may require during this period of time.

PART 2 PRODUCTS

Not applicable for this section.

PART 3 EXECUTION

3.1 INSPECTION

A. The Testing and Balancing Contractor shall act as an authorized inspection firm responsible to the Architect. He shall review the HVAC design drawings and shop drawings prior to fabrication and installation of the HVAC systems to insure that all
of the necessary balancing equipment required to balance these systems is shown.

3.2 PREPARATION

A. Coordinate Schedules with the Test and Balancing Engineer and provide sufficient time before final completion of work so that testing and balancing can be accomplished. Provide all labor and tools to make corrections to the system when required to balance the system without undue delay to the Test and Balancing Contractor. Put all equipment into full operation and continue it in operation during each working day of testing and balancing. No test and balancing work shall start until all of the air handling equipment has new filters installed. The Test and Balancing Engineer shall be kept informed during the construction of the project of major changes made to the HVAC system. Provide the Test and Balancing Contractor with one (1) set of shop drawings on all equipment which he will be required to work on when balancing the HVAC system.

B. Shop drawings shall be submitted to the Test and Balancing Contractor. The Test and Balancing Contractor will, during the construction of the HVAC system, make job site inspections to familiarize himself with the project and shall report to the Architect items installed incorrectly or not installed in accordance with the contract drawings and specifications.

C. Work shall not begin until all systems which are to be tested have been completed and are in full working order. Put all systems and equipment into full operation and continue the operation of all equipment during each working day of the testing and balancing work.

3.3 AIR DISTRIBUTION SYSTEMS TESTING AND BALANCING

A. Utilizing the latest issue of design documents, compare the installed equipment to the design and check for completeness of the installation.

B. The system and air outlet air quantities shall be balanced to the values indicated on the drawings.

C. The grille manufacturer’s outlet flow factors as determined by the ADC test code and recommended procedure for testing air outlets shall be used.

D. Pre-balance equipment check:

1. Check fan housing, ducts, duct elbows, coils, louvers, etc., to insure they are clean and free of foreign material.

2. Check filters to insure that they are clean and in place.
3. Examine drivers for proper belt tension and alignment.

4. Check fan and motor lubrication.

5. Coordinate with Electrical Contractor to verify correct motor overload protectors.

6. Coordinate with HVAC Control Contractor for proper operation and position of operating dampers.

7. Check fans for proper rotation.

E. Pre-balance System Check:

1. Verify installation of all required balancing dampers. Set all systems dampers in their open position.

2. Check for air leaks at the fan and the system ductwork. Coordinate with the Contractor for repair of leaks.

3. Position all building doors and windows (if a part of system design) in their normal position.

4. Check air temperature to insure required air temperature delivery.

F. Air Handling Equipment Balance:

1. Check motor amperage and voltage to insure motor is not being overloaded.

2. Measure and set minimum outdoor air quantity where applicable.

3. Determine the volume of air being delivered by the fan. Adjust the fan speed, if belt-driven, or the dampers in the system, if direct-driven, to increase or decrease the flow required. If the speed is increased, or the flow changes due to a damper adjustment, insure that the motor is not overloaded.

4. Check fan and motor speed, no-load amperage, operating amperage and voltage. Calculate brake horsepower.

5. Take fan static pressure readings.
6. Variation of air flow for all modes of operation from the design values shall be within +10 percent of design values.

3.4 OTHER EQUIPMENT TESTS

A. All equipment installed shall be tested, adjusted, and reported upon unless stated otherwise. The equipment discussed herein is not necessarily all of the equipment requiring testing.

B. Fans:

1. Record nameplate data.

2. Check operation of backdraft dampers.

3. Check belt alignment and belt tension.

4. Measure current, voltage, and speed (rpm).

END OF SECTION
SECTION 233113 - DUCTWORK

PART 1   GENERAL

1.1 WORK INCLUDED

A. Ductwork and Plenums
B. Fasteners
C. Sealants
D. Duct Cleaning
E. Testing

1.2 RELATED WORK

A. Section 230500 – Common Work Results for HVAC
B. Section 230529 – Hangers & Supports for HVAC
C. Section 230593 – Testing, Adjusting & Balancing For HVAC
D. Section 232115 – Duct Insulation
E. Section 233300 – Air Duct Accessories
F. Section 233423 – HVAC Power Ventilators
G. Section 233713 – Diffusers, Registers & Grilles

1.3 REFERENCE STANDARDS

A. Fabricate in accordance with the most recent edition of SMACNA HVAC Duct Construction Standards.

1.4 DEFINITIONS

A. Duct Sizes: Dimensions shown on the Drawings are sheet metal sizes.
PART 2  PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products manufactured by the following manufacturers meeting these specifications are acceptable.

B. Flexible ducts manufactured by Thermaflex, Wire Mold, Certain Tweed and ATCO are acceptable.

C. Round and oval ductwork manufactured by United Sheet Metal, Semco, General Metals, Spiro-Fab and Metal Manufacturing are acceptable.

2.2 MATERIALS

A. Galvanized Ductwork: Galvanized steel lock forming quality having zinc coating of 1.25 ounces per square foot for each side per ASTM A525 G90. All ductwork to be galvanized unless otherwise noted.

B. Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.

C. Sealant: Water resistant, fire resistive, compatible with mating materials. All duct tapes and mastics shall be listed and labeled in accordance with U.L. 181.

D. Flexible Ducts: UL 181 Class 1 airduct consisting of inner vapor barrier supported by a helically wound steel wire; wrapped with 1-1/2" thick flexible fibrous glass insulation, enclosed by a reinforced foil outer jacket. Ductwork shall be a factory fabricated assembly with hanger tab support system equal to CertainTeed Certaflex 25.

2.3 FABRICATION

A. The contractor shall visit the premises and thoroughly familiarize himself with all the details of the work and working conditions and to verify all dimensions in the field prior to fabricating ductwork. The contractor shall advise the Architect of any discrepancy prior to fabrication.

B. Size round ducts installed in place of rectangular ducts from ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
D. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on center line. Where not possible and where rectangular elbows used, provide single thickness type turning vanes.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Maximum divergence upstream of equipment to be 30 degrees and 45 degrees convergence downstream.

F. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate, or sag. Seal all duct joints and connections with "hard cast" tape sealant or equal as ducts are being assembled.

G. Provide easements where low pressure ductwork conflicts with piping and structure where easements exceed 10% duct area, split into two ducts maintaining original duct area.

2.4 DUCT GAUGES AND REINFORCEMENT

A. Provide minimum duct wall thickness and reinforcement as required by the latest edition of the SMACNA HVAC Duct Construction Standards.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

B. Clean duct system with forced air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning.

C. Seal all transverse joints with Hard Cast or equivalent.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
E. At each point where ducts pass through partitions, seal joints around duct with non-combustible material. Provide sheet metal closure around opening when exposed.

F. Paint all exposed ductwork as directed by architect.

END OF SECTION
SECTION 233115 - DUCT INSULATION

PART 1   GENERAL

1.01 WORK INCLUDED

A. Duct Thermal Insulation

B. Adhesives, Tie Wires, Tapes

1.2 RELATED WORK

A. Section 230500 – Common Work Results for HVAC

B. Section 233113 – Ductwork

1.03 QUALITY ASSURANCE

A. All insulation materials required for ductwork shall be furnished and installed under the contract. The execution of the work shall be by approved insulation contractor in strict accordance with the best practice of the trade and the intent of the specification.

B. It is mandatory that all insulation be applied in a neat and workmanlike manner. Contractor shall be required to remove and replace all insulation not applied in strict accordance with the manufacturer’s specifications or not presenting a neat finished appearance.

C. The Ductwork insulation shall meet NFPA Standards 902 and 906 for fire resistance.

1.04 SUBMITTALS

A. Submit product data and installation instructions in accordance with Section 230500.

1.05 REFERENCE STANDARDS

A. NFPA 90A and 90B.

B. ASTM Standard E84-75.

1.06 JOB CONDITIONS
A. Deliver material to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Materials as manufactured by Certain-Teed, Johns-Manville, Knaul, Owens-Corning, Foster Products, Childers or approved equal meeting these specifications are acceptable.

2.02 TYPE AND PERFORMANCE

A. Adhesives and Insulation Materials: Composite fire and smoke hazard ratings maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.

B. Round and Rectangular Supply Air Ducts: Rigid or Flexible fibrous glass insulation, 1 1/2 inch thick "K" value at 75 degrees F maximum 0.26 btu/hr./sq.ft./Deg. F/hr. with factory applied reinforced aluminum foil vapor barrier for temperatures for +40 Deg. F to +250 Deg. F services.

PART 3 EXECUTION

3.01 PREPARATION

A. Do not install covering before ductwork has been tested and approved.

B. Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.

3.02 INSTALLATION

A. Ensure installation is continuous through inside walls. Pack around ducts with fireproof self-supporting insulation material, properly sealed.

B. Finish insulation neatly at hangers, supports and other protrusions.

C. Locate insulation or cover seams in least visible locations.

D. Concealed Ducts: Adhere flexible insulation to ductwork with adhesive applied in 6 inch wide strips on 16 inch centers. Provide 16 gage annealed tie wire tied, spiral wound or half hitched at 16 inch centers for securing duct insulation until adhesive sets. Butt insulation and seal joints and breaks [in ducts conveying air at less than room temperature] with 2 inch of foil adhered over joint.
E. Exposed Ducts: Adhere rigid insulation to ductwork with weld pins at 12 inches on center. Butt insulation and seal joints, breaks and pins with 2 inch wide adhesive backed foil tape.

F. Cover exposed insulation with 8 oz. canvas jacket.

G. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

END OF SECTION
SECTION 233300 – AIR DUCT ACCESSORIES

PART 1   GENERAL

1.1   WORK INCLUDED
   A. Access Doors
   B. Balancing Dampers
   C. Flexible Connections
   D. Turning Vanes

1.2   RELATED WORK
   A. Section 230500 – Common Work Results for HVAC
   B. Section 230593 – Testing, Adjusting & Balancing For HVAC
   C. Section 233113 – Ductwork
   D. Section 232114 – Duct Lining
   E. Section 233415 – Duct Insulation
   F. Section 233423 – HVAC Power Ventilators
   G. Section 233713 – Diffusers, Registers & Grilles

1.3   QUALITY ASSURANCE
   A. Access doors shall be UL labeled.
   B. Accessories shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems as applicable.
   C. Fabricate in accordance with ASHRAE handbooks and SMACNA duct manuals.

1.4   SUBMITTALS
   A. Submit product data in accordance with Section 230500.
PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products manufactured by Air Balance, Greenheck, DuroDyne, Penn, Krueger, Safe Air, Dowco or Ruskin meeting these specifications are acceptable.

2.2 ACCESS DOORS

A. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For internally lined or insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

B. Provide two hinges and two sash locks for sizes up to 18 inch square, two hinges and two compression latches with outside and inside handles for sizes up to 24 inch x 48 inch. Provide an additional hinge for larger sizes.

2.3 DAMPERS

A. Fabricate balancing dampers of galvanized steel, minimum 16 gauge and provide with locking quadrants.

B. Fabricate splitter dampers of double thickness sheet metal, properly stiffened to avoid vibration. Size on basis of straight air volume proportioning.

C. Fabricate multi-blade damper of opposed blade pattern with maximum size 16 sq. ft. Assemble center and edge crimped blade in prime coated or galvanized channel frame with suitable hardware and locking quadrant.

D. Fabricate multi-blade, counter balanced backdraft dampers with blades a maximum 8 inch width having felt or flexible vinyl sealing edges, linked together in rattle-free manner and width adjustment device to permit setting for varying differential static pressure.

2.4 FLEXIBLE CONNECTION

A. Fabricate of neoprene coated flameproof fabric approximately 4 inch wide tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6 inch intervals.

2.5 TURNING VANES

A. Fabricate turning vanes and rails of 24 gauge galvanized steel and assemble rattle free.
B. Turning vanes shall be single thickness prefabricated or assembled per manufacturer's instructions for optimum shape.

C. Secure to duct with sheet metal screws, rivets or weld. Final assembly shall be rattle free.

2.6 APPLICATION

A. Provide access doors for inspection and cleaning at filters, fans, terminal units, fire/smoke dampers, and as indicated on the drawings. Review locations prior to fabrication.

B. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing and where indicated on the drawings.

C. Use splitter dampers and air extractor only where indicated on drawings or as required for system balancing.

D. Provide flexible connections immediately adjacent to equipment, in ducts associated with fans, equipment subject to forced vibration and as shown on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer’s printed instructions and SMACNA Standards.

B. For connections to fans, install 1/2 inch thick neoprene pad over fabric and hold in place with additional metal strips.

END OF SECTION
SECTION 233423 – HVAC POWER VENTILATORS

PART 1   GENERAL

1.1 WORK INCLUDED
   A. Curb Mounted Roof Exhaust Fans

1.2 RELATED WORK
   A. Section 230500 – Common Work Results for HVAC
   B. Section 230593 – Testing, Adjusting & Balancing For HVAC
   C. Section 233113 – Ductwork
   D. Section 233300 – Air Duct Accessories
   E. Division 26 – Electrical Requirements

1.3 QUALITY ASSURANCE
   A. AMCA rated for both sound and air flow performance
   B. AMCA rating seals

1.4 SUBMITTALS
   A. Submit product data including dimensional data, material specifications, capacity
data, sound data and installation procedures in accordance with Section 230500.

PART 2   PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
   A. Products manufactured by Greenheck, Cook, Twin City, Penn, Jenn Fan or ACME
meeting these specifications are acceptable.

2.2 CURB MOUNTED ROOF EXHAUST FAN
   A. Provide direct driven or belt driven centrifugal roof exhausters as scheduled.
   Performance shall meet or exceed that scheduled.
B. Ventilator housing shall be of heavy gauge aluminum construction or formed galvanized steel and shall be weatherproof, incorporating an integral weather shield.

C. Ventilators shall be furnished with birdscreen.

D. Fan wheels shall be backward inclined, non overloading centrifugal type, statically and dynamically balanced. RPM and motor horsepower shall be as specified and shall not exceed the maximum listing in the manufacturer's catalog for the unit specified.

E. Housing shall be provided with wiring channel and is to be of the direct discharge design.

F. Motor and fan assembly shall be on vibration isolating mounts.

G. Motors shall be permanently lubricated, sealed ball bearing type self-cooled with clean, cool, outside air and shall be located in a compartment separate from the exhaust air stream so that no lint, heat, grease, fumes, or dust in the exhaust air can come in contact with the motor.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install roof exhauster on roof curb either shop fabricated or provided by fan manufacturer. Carefully coordinate exact curb dimensions.

B. Connect to ductwork as specified in Section 233113.

C. Balance in accordance with Section 230593.

END OF SECTION
SECTION 233713 – DIFFUSERS, REGISTERS & GRILLES

PART 1   GENERAL

1.1  WORK INCLUDED

A. Supply, Return, Transfer and Exhaust Air Devices and Accessories.

1.2  RELATED WORK

A. Section 230500 – Common Work Results for HVAC
B. Section 230593 – Testing, Adjusting & Balancing For HVAC
C. Section 233113 – Ductwork
D. Section 233300 – Air Duct Accessories

1.3  QUALITY ASSURANCE

A. Make air flow tests and sound level measurement in accordance with applicable ADC equipment test codes and ASHRAE standards.
B. Manufacturer shall certify cataloged performance and ensure correct application of air outlet types.

1.4  SUBMITTALS

A. Submit in accordance with Section 230500.

B. Submit product data and shop drawings covering each item together with schedule of outlets, listing cfm, neck velocity, NC level and Ak factor and air flow measurement procedures.

1.5  JOB CONDITIONS

A. Review requirements (including architectural drawings) of outlets as to size, finish, and type of mounting prior to submitting shop drawings and schedules of outlets.

B. Check location of outlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products manufactured by Krueger, Tuttle & Baily, Titus, J&J, Price or Nailor, meeting these specifications are acceptable.

2.2 GENERAL REQUIREMENTS

A. Provide air devices equal in all respects to those scheduled on the drawings.

B. Rate units in accordance with ADC standards.

C. Base air outlet application on space noise level of NC 35 maximum in all areas unless indicated otherwise on drawings.

D. Provide supply outlets with sponge rubber seal around edge.

E. All devices shall be factory finished.

F. When required provide air devices factory installed in metal panels painted to match air device finish. Panel shall be suitable for insertion into lay-in-tile ceilings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer’s printed instructions.

B. Paint ductwork visible behind air outlets matt black.

C. Seal square to round adaptors or lined plenum boxes air tight to diffusers or grilles.

D. When required cut metal panels for insertion in ceiling at grid location where tiles may be less than nominal size. Center diffuser or grille within modified panel.

END OF SECTION
SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Electrical equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   5. Common electrical installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Extend sleeves to unistrut support on both surfaces of walls.

F. Extend sleeves installed in floors 4” (inches) (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.
3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
      1. Building wires and cables rated 600 V and less.
      2. Connectors, splices, and terminations rated 600 V and less.
      3. Sleeves and sleeve seals for cables.
   B. Related Sections include the following:
      1. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Qualification Data: For testing agency.
   C. Field quality-control test reports.

1.4 QUALITY ASSURANCE
   A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
3. General Cable Corporation.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, and XHHW.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Minimum circuit conductor size shall be No. 12.

D. Vibrating and rotating equipment and controls: Copper. Stranded for No.10 and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway or Type XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.
3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Sleeves shall extend past wall and shall be supported by metal framing on both side of wall.

G. Extend sleeves installed in floors 4” (inches) (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance, feeder and branch circuit conductors for compliance with requirements (Provide continuity and insulation testing on all feeder and branch circuit conductor. Insulation testing shall be performed with a 500 VDC megger. Phase and neutral conductors shall be test free of short-circuits and grounds. For continuity testing, motor feeders shall be measured with motors connected and local disconnect closed; readings shall be one phase-to-ground for each phase. Test all other conductors phase-to-phase and phase-to-ground).


3. Provide testing of proper phase rotation for three-phase system. Provide individual tests at all service entrance, motor control center and other sources that feed equipment that may be adversely affected by incorrect phase rotation, especially rotating machines.
C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. The contractor shall furnish the instruments, materials, and labor for all tests at no additional cost to the owner (i.e., it must be part of the bid price). Contractor shall present to the owner three copies of certified test reports. In addition to the various electrical measurements results, the test reports shall, at minimum, include the official City of Tucson FD&M project name, the project address, City of Tucson building number, City of Tucson FD&M A/E Section project number, name of the test, name of the equipment tested, location in the building of the equipment tested, Project General contractor, Contractor performing the test, date, time, and temperature. The City Electrical Engineer desires that the contractor use pre-printed industry form, if available, for recording and reporting electrical test. The City Electrical Engineer expects the test results to be reported in a reasonable, easily read format and expects the use of good common English, accurate spelling and good penmanship in the reports. The City Electrical Engineer reserves the right to reject test reports that are difficult to interpret. This does no exclude using narrative to explain the test reports, methods and unusual field circumstances that may contribute to difficult testing situations.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519
SECTION 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

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

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Ground rods.
2. Grounding arrangements and connections for separately derived systems.

C. Qualification Data: For testing agency and testing agency’s field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems, based on NFPA 70B.
a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.

b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel 3/4 inch in diameter by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Grounding Bus: Install in electrical telephone equipment rooms as indicated in “T” series drawings.
   1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

D. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

### 3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

### 3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
D. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least two rods spaced at least 6’ from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 250 kcmil AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.

2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below
grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

   a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

   b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Report measured ground resistances that exceed the following values:

   1. Power and Lighting Equipment: 5 ohms.
   2. Pad-Mounted Equipment: 5 ohms.
   3. Maximum ground-resistance value 5 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526
SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

B. Related Sections include the following:
   1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.
   2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Nonmetallic slotted channel systems. Include Product Data for components.
   4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. ERICO International Corporation.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut; Tyco International, Ltd.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer’s standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings: Manufacturer’s standard painted coating applied according to MFMA-4.

5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. Fabco Plastics Wholesale Limited.
   d. Seasafe, Inc.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.

3. Fitting and Accessory Materials: Same as channels and angles.

4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES
A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION
A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.
D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION
A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps MSS Type 19, 21, 23, 25, or 27, complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. Support ceiling outlets boxes from ceiling structure. Support boxes in suspended ceiling systems from main runner channels, or joist, or other structural members. For boxes in suspended ceilings, supplements outlet box support with separate support to the structure as required for the expected load of the device, such a ceiling fan.
3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529
PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
B. Related Sections include the following:
   1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS
A. EMT: Electrical metallic tubing.
B. FMC: Flexible metal conduit.
C. IMC: Intermediate metal conduit.
D. LFMC: Liquidtight flexible metal conduit.

1.4 SUBMITTALS
A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.
   2. For handholes and boxes for underground wiring, including the following:
a. Duct entry provisions, including locations and duct sizes.
b. Frame and cover design.
c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.
D. EMT: ANSI C80.3.

E. FMC: Zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
   2. Fittings for EMT: compression type, steel. Set screw fittings are not allowed.
   3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. CANTEX Inc.
   3. Electri-Flex Co.
   4. Lamson & Sessions; Carlon Electrical Products.
   5. Manhattan/CDT/Cole-Flex.
   6. RACO; a Hubbell Company.
   7. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.
2.3 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Thomas & Betts Corporation.
   c. Wiremold Company (The); Electrical Sales Division.

2. The surface raceways shall be supplied as a complete system using accessories and fittings of the same manufacturer.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
7. RACO; a Hubbell Company.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover. Boxes in wall shall be 4” X 4” metal box with single mud ring. Exterior and surface boxes shall be waterproof deep bell.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Cabinets and enclosures shall have blank ends and sides, no knockouts. The contractor shall punch out openings required. All unused openings shall be plugged with manufactured plugs.
   3. Do not use single covers for junctions and pull boxes having cover length or width dimension exceeding three feet unless so approved. Sectionalize covers exceeding three feet in either dimension into two or more sections.

H. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Cabinets and enclosures shall have blank ends and sides, no knockouts. The contractor shall punch out openings required. All unused openings shall be plugged with manufactured plugs.
   7. All cabinets and enclosures shall have a protective pocket inside the front cover with schematic diagram, connection diagram, and/or as applicable...
layout drawing of wiring and components within enclosures or boxes that contain electrical equipment, terminal strips and the like.

8. All cabinets and enclosures that contain equipment like relays, terminal boards or terminal trips shall have hinged covers.

2.6 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.7 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
5. Application of Handholes and Boxes for Underground Wiring:
   a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
   b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
   c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: Rigid steel conduit.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air.
8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: IMC.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 1-inch (25.4-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit or max 270 degrees deflection.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
H. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Change from ENT to RGS conduit before rising above the floor.

I. All underground conduit elbows (sweeps) shall be rigid steel, ½” wrapped with two layers of 10 mil. PVC tape applied for corrosion protection. Do not allow PVC or PVC coated steel elbows.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
   1. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
   2. Install with a maximum of three 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
   1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.

3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

S. All panelboards shall have a minimum of (1) 3/4" spare conduit for each equivalent 3-pole spare or space stubbed out to a readily accessible location. Each 200 Amp panelboard shall have at least one 1 ¼" spare conduit stubbed out to a readily accessible location.

T. Install hubs and box connectors at conduit-to-enclosure connections.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Sleeves shall extend past wall and shall be supported by Unistrut on both sides of wall.

G. Extend sleeves installed in floors 4" (inches) (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm)
annular clear space between pipe and sleeve for installing mechanical sleeve
seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for
sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between
raceway and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for
raceway material and size. Position raceway in center of sleeve. Assemble
mechanical sleeve seals and install in annular space between raceway and
sleeve. Tighten bolts against pressure plates that cause sealing elements to
expand and make watertight seal.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall
assemblies to restore original fire-resistance rating of assembly. Firestopping
materials and installation requirements are specified in Division 07 Section
"Penetration Firestopping."

3.6 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes,
and cabinets are without damage or deterioration at time of Substantial
Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended
by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating
recommended by manufacturer.

END OF SECTION 260533
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
4. Warning labels and signs.
5. Instruction signs.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE


B. Comply with NFPA 70.

1.5 COORDINATION


B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.4 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Micarta Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      1) Primer: Exterior concrete and masonry primer.
      2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Concrete Unit Masonry:
a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

   1) Block Filler: Concrete unit masonry block filler.
   2) Finish Coats: Exterior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange snap-around label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:

   1. Fire Alarm System: Red.
   5. Mechanical and Electrical Supervisory System: Green and blue.
   7. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
   a. Power transfer switches.
   b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

H. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch (10-mm-) high letters for emergency instructions at equipment used for power transfer.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-(13-mm-) high letters on 1-1/2-inch-(38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. No “dymo label” equipment ID allowed.

2. Equipment to Be Labeled:
   a. Panelboards, electrical cabinets, and enclosures.
   b. Access doors and panels for concealed electrical items.
   c. Electrical switchgear and switchboards.
   d. Transformers.
   e. Emergency system boxes and enclosures.
   f. Disconnect switches.
   g. Motor starters.
   h. Push-button stations.
   i. Power transfer equipment.
   j. Contactors.
   k. Remote-controlled switches, dimmer modules, and control devices.
   l. Power-generating units.
   m. Intercommunication and call system master and staff stations.
   n. Television/audio components, racks, and controls.
   o. Fire-alarm control panel and annunciators.
   p. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
   q. Monitoring and control equipment.
   r. Uninterruptible power supply equipment.
   s. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.
D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with non reversible attachment appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

2. Colors for 480/277-V Circuits:
   b. Phase B: Orange.
   c. Phase C: Yellow.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

4. Install a green Equipment Grounding Conductor in each conduit.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

J. Install wire markers on conductors at the panelboard and at each load connection. Identify with panelboard or other source name and branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams. For receptacle and lighting circuits, install the marker at each outlet.
K. Control and alarm wiring shall be identified using wire markers. Each wire shall be uniquely identified within the control system of which it is part and uniquely identified from other control alarm system in the facility. Markers shall be self-adhering, wrapped around the conductor twice and sleeved with clear shrink sleeves installed over the marker.

L. All junction boxes containing conductors of one circuit only shall be neatly labeled with indelible black ink, indicating panelboard, bus way, enclosure, switchboard, or other source terminal point, including circuit number as applicable. For junction boxes containing multiple circuits, require conductors be tagged as in “K” above.

M. All motors shall be identified with a permanently attached durable tag with motor designation and function.

N. All junction boxes for the fire alarm system shall be painted red. Each junction box for any other special system shall be marked as a part of the system inherently.

END OF SECTION 260553
SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor photoelectric switches.
3. Indoor occupancy sensors.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Intermatic, Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
5. Square D; Schneider Electric.
6. TORK.
7. Watt Stopper (The).

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Configuration: SPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Program: 2 on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
5. Astronomic Time: All Selected channels.
6. Battery Backup: For schedules and time clock.
2.2 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control system specified in Division 26 Section "Network Lighting Controls."

END OF SECTION 260923
SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.
B. RMS: Root mean square.
C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
1. Ambient Temperature: Not exceeding 122 deg F

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Owner's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Measure each phase current at each panel with the panel at expected maximum demand. Require balancing of the phase currents at each panel to within +/-5% of the calculated average bus current, or as close as possible. Provide written record of the balanced bus current values.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Locks for panelboards shall be keyed alike.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
   a. Eaton Corporation; Cutler-Hammer Products.
   c. Siemens Energy & Automation, Inc.
   d. Square D.

2.2 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.
   a. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

6. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

7. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.


C. Phase and Ground Buses:
   1. Provide fully rated copper bussed panelboards. Series rated and/or aluminum bussed panelboards are not acceptable.
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material.
   1. Main and Neutral Lugs: Mechanical type.
   2. Ground Lugs and Bus Configured Terminators: Compression type.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-in circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Circuit breaker shall be of the same manufacturer.

B. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

E. Fuses are specified in Division 26 Section "Fuses."

F. Install bolt-in circuit breakers. Plug-in circuit breakers are not acceptable.

G. Provide two and three pole breakers with common trip, and shall not require more space than the equivalent number of single-pole breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices.

1. Set field-adjustable switches and circuit-breaker trip ranges.
F. Install filler plates in unused spaces.

G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:
   1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 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 262416
SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes the following:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Snap switches and wall-box dimmers.
   3. Wall-switch

B. Related Sections include the following:
   1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS
A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
D. RFI: Radio-frequency interference.
E. TVSS: Transient voltage surge suppressor.
F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. All wiring devices shall be specification grade.

E. Provide 125 Volts 20 Amp receptacles on 20 Amp branch circuit, 15 Amp receptacles are not allow.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Service Outlet Assemblies: One for every 10, but no fewer than one.
2. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; 5352 (duplex).
   c. Leviton; 5352 (duplex).
   d. Pass & Seymour, 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell
   b. Cooper; GF20
   c. Leviton
   d. Pass & Seymour; 2084.
2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
   b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
   c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
   d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover

2.6 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.
3. TVSS Devices: Blue.
4. Wiring device cover plate shall be satin finish stainless steel.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:
   1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:
   1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
   1. Install in the vertical position with the ground up.
   2. Install in the horizontal position with the neutral up.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Wiring device cover plate shall be satin finish stainless steel.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

J. Wall switches (toggle switches, light switches) shall be grounding type. For single throw switches install with “ON” in the “up” position.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."
   1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726
SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in switches and controllers.
2. Spare-fuse cabinets.

1.3 SUBMITTALS

A. 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.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, 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.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

E. All fuses shall be of the same manufacturer.

F. All power fuses shall be equipped with a blown-fuse indicator that provides visible evidence of fuse operation while installed in the fuse mounting.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer’s ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Quantity equal to 10 (%) percent of each fuse type and size, but no fewer than 6 of each type and size.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Ferraz Shawmut, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 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.

3.2 FUSE APPLICATIONS

A. Service Entrance: Class L, time delay.

B. Feeders: Class L, time delay.

C. Motor Branch Circuits: Class RK5, time delay.

D. Other Branch Circuits: Class RK5, time delay.
3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813
SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Bolted-pressure contact switches.
4. High-pressure, butt-type contact switches.
5. Molded-case circuit breakers.
7. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer’s written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 122 deg F

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent
surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
4. Square D/Group Schneider.

B. Fusible Switch, 600A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 600A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and $I^2t$ response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

C. Molded-Case Circuit-Breaker Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Hangers and Supports for Electrical Systems," and concrete materials and installation requirements are specified in Division 03.
3.3 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.
4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

C. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
D. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

E. Perform the following field tests and inspections and prepare test reports:

1. Test mounting and anchorage devices according to requirements in Division 26 Section “Vibration and Seismic Controls for Electrical Systems.”
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Infrared Scanning:
   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
   b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
   c. Instruments, Equipment and Reports:
      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.
END OF SECTION 262816
SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:
   1. Across-the-line, manual and magnetic controllers.
   2. Reduced-voltage controllers.

B. Related Sections include the following:
   1. Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for low-voltage power, control, and communication surge suppressors.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer’s technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Routine maintenance requirements for enclosed controllers and all installed components.
   2. Manufacturer’s written instructions for testing and adjusting overcurrent protective devices.

D. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
E. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Indicate method of providing temporary utilities.
3. Do not proceed with interruption of electrical service without Owner's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

D. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

E. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Furnish one spare for every five installed, but no fewer than one set of three of each type and rating.
2. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Eaton Corporation; Cutler-Hammer Products.
4. Rockwell Automation; Allen-Bradley Co.; Industrial Control Group.
5. Siemens/Furnas Controls.
6. Square D.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

A. Manual Controller: NEMA ICS 2, general purpose, Class A, with "quick-make, quick-break" toggle or pushbutton action, and marked to show whether unit is "OFF," "ON," or "TRIPPED."

1. Overload Relay: Ambient-compensated type with inverse-time-current characteristics and NEMA ICS 2, Class 10 tripping characteristics. Relays
shall have heaters and sensors in each phase, matched to nameplate, full-load current of specific motor to which they connect and shall have appropriate adjustment for duty cycle.

**B. Magnetic Controller: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.**

1. Control Circuit: 120 V; obtained from integral control power transformer with a control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

2. Overload Relay: Ambient-compensated type with inverse-time-current characteristic and NEMA ICS 2, Class 10 tripping characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect and with appropriate adjustment for duty cycle.

3. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 10 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

**C. Combination Magnetic Controller: Factory-assembled combination controller and disconnect switch.**

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by an NRTL.


### 2.3 ENCLOSURES

**A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.**

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
2.4 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.


C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

2.5 FACTORY FINISHES

A. Finish: Manufacturer’s standard Gray paint applied to factory-assembled and -tested enclosed controllers before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, controller, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

A. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
B. Install freestanding equipment on concrete bases.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.4 CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 26 Section "Hangers and Supports for Electrical Systems," and concrete materials and installation requirements are specified in Division 03.

3.5 IDENTIFICATION

A. Identify enclosed controller, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.6 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.

   1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
   2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.7 CONNECTIONS

A. Conduit installation requirements are specified in other Division 26 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
3.8 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. 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.

3.9 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

END OF SECTION 262913
SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior lighting fixtures, lamps, and ballasts.
   2. Emergency lighting units.
   3. Exit signs.
   4. Lighting fixture supports.
   5. Retrofit kits for fluorescent lighting fixtures.

B. Related Sections include the following:
   1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

G. RCR: Room cavity ratio.
1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 23 Section "Diffusers, Registers, and Grilles."
6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section "Diffusers, Registers, and Grilles."
7. Life, output, and energy-efficiency data for lamps.
8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
   a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
   b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.


C. Field quality-control test reports.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

E. Warranties: Special warranties specified in this Section.
1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Provide luminaries of the same configuration (Lay-in troffers, down light cans, outdoor floods, etc.) and luminaries represented by multiple luminarie type designations, but intended to match each other, shall be product of the same manufacturer.

D. Any new retrofit/assembly or “kit” shall be UL listed as such.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

A. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.

2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

B. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Two year(s) from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. Metal Parts: Free of burrs and sharp corners and edges.

F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without
use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

I. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Transient Voltage Protection: IEEE C62.41, Category A or better.
4. Operating Frequency: 42 kHz or higher.
5. Lamp Current Crest Factor: 1.7 or less.
6. BF: 0.85 or higher.
7. Power Factor: 0.98 or higher.
8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

C. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

D. Ballasts for Low-Temperature Environments:
   1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic or electromagnetic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
   2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.

E. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
   1. Dimming Range: 100 to 5 percent of rated lamp lumens.
   2. Ballast Input Watts: Can be reduced to 20 percent of normal.
   3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

F. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
   1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
      a. High-Level Operation: 100 percent of rated lamp lumens.
      b. Low-Level Operation: 30 percent of rated lamp lumens.
   2. Ballast shall provide equal current to each lamp in each operating mode.
   3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: A.
   4. Total Harmonic Distortion Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
12. Provide instant-start ballasts, and bulbs with a minimum life of 10,000 hours.

B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

2.5 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.
b. Charger: Fully automatic, solid-state type with sealed transfer relay.
c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.6 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA’s toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.

C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000 K, and average rated life of 20,000 hours, unless otherwise indicated.

E. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.

2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust aimable lighting fixtures to provide required light intensities.

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

G. Lighting fixtures shall be supported on at least two opposite corners from the building structure, not from drop ceilings, ductwork or cable trays.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100
SECTION 271100 – TELEPHONE SYSTEM

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Work included in this Section: Materials, equipment, fabrication, installation and tests for the following:

1. Telephone conduits, boxes and outlets.
2. Horizontal cables for telephone signals.

1.2 SUBMITTALS

A. Crossconnect patch panels and termination blocks at IDF racks.
B. Outlets and connectors for station cables.
C. Workstation cables.

PART 2 – MATERIALS

2.4 TELEPHONE OUTLETS (single station, non-combination outlets)

A. Provide single-gang outlets. Where instruments are to be wall-mounted, provide mounting studs on the faceplate. Faceplates are to be ivory or white, to match existing. Combination outlets (with data connectors) are specified in Section 16730: Structured Data Cabling Plants.

2.1 HORIZONTAL CABLING

A. Provide workstation cables as specified on the drawings.

B. All horizontal cable shall be plenum rated and shall be installed without bridges, splices or taps.

2.2 CROSS-CONNECTS AND TERMINATIONS

A. Provide patch panels for all telephone cable pairs at the telecom terminal boards. Patch panels shall be Panduit CPPLA48WBLY or approved equal. Provide CAT 5E jack for each outlet indicated on drawings.
2.1 GENERAL

A. Provide all terminations required for a full and functioning system.

B. Provide identification of cables and pairs at all termination points in accordance with the requirements of the EIA/TIA national standards. The cable management and identification protocol for this section shall be coordinated and compatible with that of the data cabling systems described in Section 271500: Structural Data Cabling Plants.

C. Provide written results of the tests of the cable pairs after installation with a record of pass/fail for each pair.

D. Provide the Owner with three copies of the cable management and record plan.

**End of Section**
PART 1 – GENERAL

1.1 WORK INCLUDED

A. Work included in this Section: Materials, equipment, fabrication, installation and tests for the following:

1. Data raceways, boxes and outlets.
2. Horizontal cabling.
3. Terminations and cross connects at patch panels for data system cabling.
4. Cable testing.

1.2 CODES AND STANDARDS

A. PCC’s telecommunications infrastructure standards shall generally follow the applicable standards and technical service bulletins published by the Electronic Industry Association/Telecommunications Industry Association (EIA/TIA). The specific EIA/TIA standards are indicated in sections within this document. While the EIA/TIA standards are considered the primary standards, standards from other organizations such as Underwriter’s Laboratory and the American National Standards Institute may also apply.

B. All pertaining statutes, ordinances, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction over the construction of telecommunications cable systems shall be followed in the design and installation of new cable systems. These include, without limitation, applicable building codes, handicapped regulations, municipal codes, fire codes, State Statutes and the regulations of the Occupational Safety and Health Administration (OSHA) unless superseded by State Statute or local law.

C. All work shall conform to all local codes and ordinances, as applicable. ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-569-A shall be adhered to during all installation activities. Methodologies outlined in the latest edition of the BICSI Telecommunications Distribution Methods Manual shall also be used during all installation activities. Should conflicts exist with the foregoing, the authority having jurisdiction for enforcement will have responsibility for making interpretation.

1.3 SUBMITTALS

A. Termination, cross connect and cable management components to be used at existing racks and/or frames.
B. Cables.

C. Station outlets and connectors.

1.4 QUALIFICATIONS

Construction projects require the use of a Registered Communications Distribution Designer (RCDD®) with a current Building Industry Consulting Service International (BICSI) registration, either on staff or on acting as a consultant to the contractor or sub-contractor, who will be ultimately responsible for the design, installation and Warranty of this project. The RCDD® must have sufficient experience in this type project as to be able to lend adequate technical support to the field installers/technicians during installation, during the warranty period, and during any extended warranty periods or maintenance contracts. The RCDD® must be present at the beginning and end of each phase and physically conduct project walkthroughs at these times.

The selected cable contractor shall be fully capable and experienced in the installation of telecommunications cable plant. To ensure the system has continued support, PCC will contract only with vendors having a successful history of sales, installation, service, and support. During the evaluation process, PCC may, with full cooperation of the vendor, visit vendors’ places of business, observe operations, and inspect records. The vendor must have a minimum of three (3) years of experience.

A resume of the responsible RCDD® must be attached to vendor response for evaluation by PCC. Should the RCDD® assigned to this project change during the installation; the new RCDD® assigned must also submit a resume for review by PCC.

If, in the opinion of PCC, the RCDD® does not possess adequate qualifications to support the project, PCC reserves the right to require the contractor or sub-contractor to assign a RCDD® who, in PCC’s opinion, possesses the necessary skills and experience required of this project.

The vendor must also be an approved Panduit Partner with the ability to receive a Panduit Warranty. A copy of their Panduit Certification must be submitted to the general contractor or sub-contractor.

PART 2 – MATERIALS
2.1 Telecommunication Closet / Equipment Rooms

A. Wire management shall include one (2) 2-position wire management panel for each 48 ports and not less than two (4) panels per rack. Wire management panels shall be Panduit wire manager part# NCMH2 or equal. Vertical wire management shall be dual channel #PRV8 with 2 doors each part #PRD8 or equal, placed between all racks. In a single rack application, two side vertical wire management is required.

B. Patch panels are to be Panduit part # CPPLA48WBLY. The outlets shall be terminated on the patch panels in the rack in order from lowest to highest workstation number, left to right, top to bottom as follows:

The workstation red outlet (#1) shall terminate in the patch panel starting at the top of the rack in the position right of the leftmost hole.
The workstation blue outlet (#2) shall terminate in the patch panel's next hole.
The workstation yellow outlet shall terminate on a separate patch panel.

D. Spare patch panel outlets shall be installed to provide for a minimum of fifteen (15) percent growth.

F. Provide video system signal taps that are two (2), four (4) or eight (8) port design as required, that are powder-coated for corrosion protection and that are fitted with moisture and RF gaskets to prevent moisture ingress and radio frequency leakage. Taps shall be Scientific-Atlanta #SAT2F-XX, #SAT4F-XX or #SAT8F-XX (or approved equal) as required, where “XX” equals the specified value of the tap required.

G. Provide video system amplifiers, Blonder Tongue #BIDA 750 or approved equal, with a nominal gain of 45 dB as required to maintain signal levels.

2.2 Inside Plant Cabling and Requirements - Horizontal

A. Install cables with two (2) feet (609 mm) of slack at each outlet or at the entrance of the conduit.

B. Remove all existing cabling which is not reused from patch panel to removed outlet.

C. Keep cables eighteen (18) inches (457 mm) away from EMF-producing fixtures, transformers, etc. Where the distance cannot be maintained, install cables in metallic conduit. Support free-run cables at distances not exceeding five (5) feet (1.5 m).

D. Use tubular cable runway or eighteen (18) inch (457 mm) wide cable tray, routed
above corridor ceilings, supported by wall brackets or hanger rods.

E. Provide one (1) 1-inch empty conduit stub from information outlets up to an accessible above-ceiling location. Outlet boxes in hard-walled office areas and junction boxes serving modular furniture systems shall be four (4) inches x four (4) inches and as deep as possible with double-gang rings.

F. Provide 4-pair extended frequency Category 5E cables to each data and voice jack. Quantities of jacks and cables shall be per plan.

G. Provide voice and data cables with 24 AWG solid copper insulated conductors formed into individually twisted pairs and enclosed by a plenum jacket. The cable shall be intended for use in gigabit ethernet applications and include the factory test report. The cable must maintain an impedance of 100 ohms across the entire frequency spectrum. Horizontal cable shall be certified to meet or exceed the electrical performance specifications being established for Category 5E as specified in EIA/TIA Technical Systems Bulletin TSB-36.

Category 5E cable installation and termination practices shall be in compliance with EIA/TIA Technical Systems Bulletin TSB-40 and TSB-95.

I. Horizontal cable will be plenum rated and must be classified as meeting the low flame spread and smoke producing characteristics of the National Electrical Code, Section 800-3(d)(b), as determined by the Underwriter's Laboratories.

J. Install horizontal cable without bridges, splices, or taps.

K. All newly installed telecommunications conduits shall be used to support and protect communications cabling only. Under no circumstances shall line voltage electrical cabling be located within any conduit used to route communications cabling.

L. No section of conduit shall contain more than three (3) 90 degree bends between pull points or junction/pull boxes.

M. Video drop cables from telecommunications closets to individual outlets in rooms shall be RG-6 with 18 AWG solid copper clad steel conductor, 0.170 inch foam FEP dielectric, aluminum foil and 90% aluminum braid outer conductors with 21.0 Ω/Km nominal DC resistance, insulated with polyvinylidene fluoride (plenum rated) jacket as required. Nominal capacitance shall be 50±3.0 pF/km, nominal impedance shall be 75 Ω and nominal velocity of propagation shall be 82%. Cable shall be installed in continuous sections without splices. Special care shall be taken to prevent any kinks from occurring that would render the affected section useless. Connectors for drop cables shall be Gilbert #GABNC6AHS322L or approved equal.
2.3 Information Outlets

A. All information outlets will be of a modular design that will allow for the easy transition to other connector types if needed in the future. Provide 4-pair extended frequency Category 5E cable to each data and voice jack.

B. Voice jack in the information outlets will be EIA/TIA standards call for all eight (8) conductors in the four (4) pair cables to be terminated on a single eight (8) position/eight (8) conductor jack in the information outlet.

Voice Jack Configuration Summary:

Voice jacks in the information outlets shall be equipped with EIA/TIA Category 5E jacks configured identically to the data outlet. All eight (8) conductors in the four (4) pair data cable will be terminated on the first voice jack in accordance with the EIA/TIA standard using the 568B pinning sequence. The jacks are to be yellow in color and number with the same number as the other end patch panel number.

C. Data jacks in the information outlets shall be equipped with EIA/TIA Category 5E jacks configured identically to the information outlet. All eight (8) conductors in the four (4) pair data cable will be terminated on the first data jack in accordance with the EIA/TIA standard using the 568B pinning sequence. An additional four (4) pair cable shall be installed and terminated on the second data jack. All eight (8) conductors of the second data cable will be terminated on the second data jack using the EIA 568B pinning sequence.

Data Jack Configuration Summary:

Eight-conductor (RJ-45) Category 5E non-keyed jacks with EIA/TIA 568B pinning sequence. Four (4) pair UTP workstation cable shall supplied to each jack.

D. The wiring sequence in the jacks shall not be altered or reconfigured except to match the standards detailed above. Under no circumstances should it be necessary to rewire a jack to accommodate a specific manufacturer's equipment. If any equipment requires a non-standard wiring sequence, the adaptation shall be made with customized drop and patch cords or modular to modular adapters.

E. The outlet labeled #1 is red, #2 is blue, #3 is red, #4 is blue, #5 is red, #6 is blue, #7 is red, #8 is blue.

F. Information outlets in new construction or renovations require a four (4) inch square deep box.
G. Video outlets shall be ModTap single-gang bezel with one (1) #17-51-V-0 connector or approved equal. The faceplate should match the color of the other information outlets in the room.

2.4 Basic Pathway Materials and Requirements

A. Conduits - Above Grade

1. Minimum conduit size shall be 1-inch. Conduits shall be routed parallel or perpendicular to the building lines. No diagonal runs will be permitted.

2. Conduits two (2) inches (50 mm) and smaller shall be steel EMT. The EMT shall be galvanized on the outside and coated on the inside with a smooth, hard finish of lacquer, varnish or enamel and shall comply with UL Standard UL797 and ANSI C80-1. EMT couplings and box connectors for EMT shall be of the steel compression gland type.

3. Conduits 2 ½ inches (64 mm) and larger shall be rigid galvanized steel (RGS). RGS conduit shall be hot-dipped galvanized steel with zinc coating or corrosion resistant lacquer on the inside, and shall comply with UL Standard UL6 and ANSI C80-1. Fittings shall be threaded, water and concrete-tight.

4. All conduits subject to mechanical injury or exposed to the elements shall be rigid galvanized steel.

5. Conduit from a workstation that does not run home to the telecommunications closet but rather is specified as a stub out above a lay-in tile ceiling shall include a gentle sweep toward the proposed TC, a connector and bushing.

6. Where conduits are not contiguous from workstation to closet, cables must be supported in an approved method (J-hooks or cable tray system) every five (5) feet (1.5m).

7. Raceways and conduits passing through fire barriers shall be fire stopped in accordance with all NFPA codes. Fire stopping rating shall match the rating of the wall being penetrated, but at a minimum be rated for one (1) hour.

B. Junction and Pull boxes

1. Boxes shall be of the size required by the National Electrical Code or larger in size. Except as noted on the Drawings, or as hereinafter specified, boxes shall be fabricated of galvanized code gauge steel and each shall be of a type approved for its particular location and purpose.
2. Junction boxes shall be four (4) inch square deep. Junction boxes shall have proper cover plates to match the surrounding environment. Junction boxes shall not open into finished areas unless specifically permitted by the Project Manager. If determined necessary for cable installation, additional pull boxes or junction boxes may be installed in unfinished areas or in concealed but accessible locations.

3. Where pull boxes larger than outlet boxes are required, galvanized code gauge sheet steel boxes may be used with covers attached by brass machine screws. Boxes exposed to the weather shall be approved for the purpose and conduit entrances on the side or top shall be made by means of Square D Company, or equal, interchangeable hub with gasket and adapter nut. Pull boxes exposed to the weather shall be gasketed and weatherproof.

PART 3 – EXECUTION

3.1 Category 5 Testing and Labeling

a. Test equipment shall be suitable for certifying all EIA/TIA 568A Addendum 5 specifications. Performance requirements for testers will meet the level II-E accuracy. Contractor shall provide proof of current factory calibration of all test equipment.

b. Contractor shall provide a complete test plan, to the Project Manager, seven (7) days prior to the proposed test date, specifying capabilities and function to be tested. Tests shall be in accordance with TSB67 level II-E accuracy. All tests shall be forwarded to the Project Manager upon completion.

c. Contractor shall test and certify all new and retained existing station cable for all EIA/TIA 568A Addendum 5 Additional Transmission Performance Guidelines.

d. Contractor shall provide test reports in both booklet form and electronic flat ASCII file format.

e. Contractor shall provide a reproducible right reading sepia and one electronically formatted in the current release of Auto-Cad copy of floor plan as-built of communications, cableways, data and special circuit plans (on a separate layer compatible with PCC Facilities Planning backgrounds) to the Project Manager.
f. Contractor shall certify and warrant the complete system for operation at current EIA/TIA 568A 100 MHz specifications for a period of not less than ten (10) years.

g. Horizontal cable runs shall be identified at the workstation end of the cable according to the following scheme:

**CAMPUS - BUILDING - TELECOMMUNICATION CLOSET - PATCH PANEL JACKET**

Example: DC-CC-IDF2-B-44 is at the Downtown campus in the CC building, IDF #2, patch panel ‘B’, in jacket 44.

### 3.2 Video Cabling Testing

a. Contractor will provide a complete test plan, to the Project Manager, seven (7) days prior to the proposed test date, specifying capabilities and function to be tested. All tests shall be forwarded to the Project Manager upon completion.

b. Contractor shall provide test reports, in both booklet form and electronic flat ASCII file format.

c. Contractor shall provide a reproducible right reading sepia and one electronically formatted in the current release of Auto-Cad copy of floor plan as-builts of communications, cableways, data and special circuit plans (on a separate layer compatible with PCC Facilities Planning backgrounds) to the Project Manager.

d. Contractor will provide a system that will deliver a minimum signal level of +5dBmv for each television station outlet from 50mhz to 600mhz with a maximum slope of +/- 6dB.

After completion of the system installation and prior to connection to the source, the system shall be subjected to a standard sweep test. Deficiencies that are found should be corrected and the system re-tested prior to acceptance. Final operational acceptance testing will also include a demonstration in the presence of the project manager.

**End of Section**
SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Electronic safety and security equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

3. Pressure Plates: Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.
3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch
(25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 280500
SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes fire alarm systems.

1.3 DEFINITIONS
A. FACP: Fire alarm control panel.
B. LED: Light-emitting diode.
C. NICET: National Institute for Certification in Engineering Technologies.
D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION
A. Noncoded, addressable system; multiplexed signal transmission dedicated to fire alarm service only.
   1. Interface with existing fire alarm system.
B. Noncoded, analog-addressable system; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.
   1. Interface with existing fire alarm system.

1.5 PERFORMANCE REQUIREMENTS
A. Comply with NFPA 72.
B. Premises protection includes building construction and occupancy type.
C. Fire alarm signal initiation shall be by one or more of the following devices:

2. Heat detectors.
3. Smoke detectors.
4. Verified automatic alarm operation of smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire standpipe system.

D. Fire alarm signal shall initiate the following actions:

1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
8. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
9. Record events in the system memory.
10. Record events by the system printer.

E. Supervisory signal initiation shall be by one or more of the following devices or actions:

1. Operation of a fire-protection system valve tamper.

F. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at the FACP.
4. Ground or a single break in FACP internal circuits.
5. Abnormal ac voltage at the FACP.
6. A break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at the FACP or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.
G. System Trouble and Supervisory Signal Actions: Ring trouble bell and announce at the FACP and remote annunciators. Record the event on system printer.

1.6 SUBMITTALS

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

B. Shop Drawings:

1. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire alarm system design.
   b. Fire alarm certified by NICET, minimum Level III.

2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

3. Device Address List: Coordinate with final system programming.

4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.

5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.


7. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

8. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

9. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

10. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. Qualification Data: For Installer.
D. Field quality-control test reports.

E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner’s manual. Include abbreviated operating instructions for mounting at the FACP.

F. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 01 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

G. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.

2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
   a. Hard copies on paper to Owner, Architect, and authorities having jurisdiction.
   b. Electronic media may be provided to Architect, and authorities having jurisdiction.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Work of this Section be performed by a UL-listed company.

C. Installer Qualifications: Personnel certified by NICET as Fire Alarm Level II, III.

D. 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.
1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of fire alarm service.
2. Do not proceed with interruption of fire alarm service without Owner's written permission.

1.9 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment: Maintain fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke, Fire, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. FACP and Equipment:
   a. Edwards Systems Technology Inc., EST3

2. Wire and Cable:
   a. Comtran Corporation.
   b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
   c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
   d. West Penn Wire/CDT; a division of Cable Design Technologies.

2.2 FACP

A. General Description:
   1. Modular, power-limited design with electronic modules, UL 864 listed.
   2. Addressable initiation devices that communicate device identity and status.
      a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
      b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
   3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Signaling Line Circuits: NFPA 72, Class A, Style 2, 5, 6, 7.
2. Signaling Line Circuits: NFPA 72, Class B, Style 0.5, 1, 3, 3.5, 4, 4.5.
   a. System Layout: Install no more than 50 addressable devices on each signaling line circuit.
3. Notification-Appliance Circuits: NFPA 72, Class A, Style Z.
5. Actuation of alarm notification appliances, annunciation, and actuation of suppression systems shall occur within 20 seconds after the activation of an initiating device.
6. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel FACP indication and system reset if the alarm is not verified.

E. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41, 60 beats per minute, march-time pattern, 120 beats per minute, march-time pattern.

F. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

G. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

H. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

J. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.

K. Service Modem: Ports shall be RS-232 for system printer and for connection to a dial-in terminal unit.

1. The dial-in port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

L. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

M. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory and digital alarm communicator transmitter shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM SYSTEM POWER."

N. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
   2. Battery and Charger Capacity: Comply with NFPA 72.

O. Surge Protection:
   1. Install surge protection on normal ac power for the FACP and its accessories. Comply with Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for auxiliary panel suppressors.
   2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

P. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer’s surface back box.
   1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
   2. Station Reset: Key- or wrench-operated switch.
   3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
   4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.
2.4 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Multipurpose type, containing the following:
   a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   b. Piezoelectric sounder rated at 88 dBA at 10 feet (3 m) according to UL 464.
   c. Heat sensor, combination rate-of-rise and fixed temperature.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
   a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg F (8 or 11 deg C) per minute.
   b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F (57 or 68 deg C).
   c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

C. Ionization Smoke Detector:

1. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
2. Detector Sensitivity: Between 0.5 and 1.7 percent/foot (0.0016 and 0.0056 percent/mm) smoke obscuration when tested according to UL 268A.
D. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:
   a. Sensor: LED or infrared light source with matching silicon-cell receiver.
   b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

2. Ionization Smoke Detectors:
   a. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
   b. Detector Sensitivity: Between 0.5 and 1.7 percent/foot (0.0016 and 0.0056 percent/mm) smoke obscuration when tested according to UL 268A.

3. UL 268A listed, operating at 24-V dc, nominal.

4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

5. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
   a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.

6. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.

7. Integral Visual-Indicating Light: LED type. Indicating detector has operated, and power-on status. Provide remote status and alarm indicator and test station where indicated.

8. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

9. Each sensor shall have multiple levels of detection sensitivity.

10. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.

2.5 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate-of-rise of temperature that exceeds 15 deg F (8 deg C) per minute, unless otherwise indicated.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

D. Continuous Linear Heat-Detector System: Consists of detector cable and control unit.
   1. Detector Cable: Rated detection temperature 155 deg F (68 deg C). Listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short circuit wires at the location of elevated temperature.
   2. Control Unit: Two-zone or multizone unit as indicated. Provides same system power supply, supervision, and alarm features as specified for the central FACP.
   3. Signals to the Central FACP: Any type of local system trouble is reported to the central FACP as a composite "trouble" signal. Alarms on each detection zone are individually reported to the central FACP as separately identified zones.
   4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.6 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
B. Bells: Electric-vibrating, 24-V dc, under-dome type; with provision for housing the operating mechanism behind the bell. Bells shall produce a sound-pressure level of 94 dBA, measured 10 feet (3 m) from the bell. 10-inch (254-mm) size, unless otherwise indicated. Bells are weatherproof where indicated.

C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn.

F. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
   1. Rated Light Output: 110 candela.
   2. Strobe Leads: Factory connected to screw terminals.

G. Voice/Tone Speakers:
   1. UL 1480 listed.
   2. High-Range Units: Rated 2 to 15 W.
   3. Low-Range Units: Rated 1 to 2 W.
   4. Mounting: Flush, semirecessed, or surface mounted; bidirectional as indicated.
   5. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

2.7 SPRINKLER SYSTEM REMOTE INDICATORS

A. Remote status and alarm indicator and test stations, with LED indicating lights. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.


B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled according to UL 632.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising 2 lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.
2.11 SYSTEM PRINTER

A. Listed and labeled as an integral part of the fire alarm system.

2.12 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of the device.
2. Finish: Paint of color to match the protected device.

2.13 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.


1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Smoke or Heat Detector Spacing:

1. Smooth ceiling spacing shall not exceed 30 feet (9 m), the rating of the detector.
2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.

3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.

B. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.

C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.

D. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

E. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

F. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

J. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

K. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

L. Antenna for Radio Alarm Transmitter: Mount to building structure where indicated. Use mounting arrangement and substrate connection that will resist 100-mph (160-km/h) wind load with a 1.3 gust factor without damage.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:
1. NECA 1.
2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.

2. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.
3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification for Electrical Systems."

B. Install instructions frame in a location visible from the FACP.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

3.5 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

C. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

D. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
   a. Include the existing system in tests and inspections.
3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.

C. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

D. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 283100
STRUCTURAL CALCULATIONS
FOR
PCC WEST CAMPUS
GYMNASIUM RENOVATION
PHASE II
PREPARED FOR
BWS ARCHITECTS
CODE: 2012 IBC

LATERAL LOAD = 10 PSF

ALLOWABLE SOIL B.R.G. = 1500 PSF
(NO SOILS REPORT)

WALL WT = 48 PSF (6" CMU)
## Cantilevered Retaining Wall

### Description:
- **Typical 6" CMU Wall - 9'-6" High**

### Criteria
- **Retained Height**: 0.00 ft
- **Wall height above soil**: 9.67 ft
- **Slope Behind Wall**: 0.33 : 1
- **Height of Soil over Toe**: 0.00 ft
- **Water height over heel**: 0.0 ft
- **Vertical component of active load**: 0.0 ft
- **Lateral soil pressure options**:
  - **NOT USED for Soil Pressure**
  - **NOT USED for Sliding Resistance**
  - **NOT USED for Overturning Resistance**

### Surcharge Loads
- **Surcharge Over Heel**: 0.0 psf
- **Used to Resist Sliding & Overturning**: 0.0 psf
  - **Used for Sliding & Overturning**: 0.0 psf

### Axial Load Applied to Stem
- **Axial Dead Load**: 0.0 lbs
- **Axial Live Load**: 0.0 lbs
- **Axial Load Eccentricity**: 0.0 in

### Design Summary
- **Wall Stability Ratios**
  - **Overturning**: 1.59 OK
  - **Sliding**: Slab Resists All Sliding 13.08 OK
  - **Total Bearing Load**: 802 lbs
  - **Resultant acc.**: 8.48 in
- **Soil Pressure**
  - **Soil Pressure @ Toe**: 1,278 psf OK
  - **Soil Pressure @ Heel**: 0 psf OK
  - **Soil Pressure Less Than Allowable**: 1,500 psf
  - **Soil Factor @ Toe**: 1,534 psf
  - **Soil Factor @ Heel**: 0 psf
  - **Soil Factor @ Heel**: 7.0 psi OK
  - **Soil Factor @ Heel**: 1.4 psi OK
  - **Allowable**: 75.0 psi

### Sliding Calculations
- **Slab Resists All Sliding!**
- **Lateral Sliding Force**: 104.2 lbs
- **Less 100% Passive Force**: 0.0 lbs
- **Less 100% Friction Force**: 320.8 lbs
- **Added Force Req'd**: 0.0 lbs OK
  - **For 1.5 : 1 Stability**: 0.0 lbs OK

### Load Factors
- **Dead Load**: 1,200
- **Live Load**: 1,600
- **Earth, H**: 1,600
- **Wind, W**: 1,600
- **Seismic, E**: 1,000

### Soil Data
- **Allow Soil Bearing**: 1,500.0 psf
- **Equivalent Fluid Pressure Method**
  - **Heel Active Pressure**: 45.0 psf/ft
  - **Toe Active Pressure**: 30.0 psf/ft
  - **Passive Pressure**: 389.0 psf/ft
- **Soil Density, Heel**: 110.00pcf
- **Soil Density, Toe**: 0.00pcf
- **Friction Coefficient between Soil & Wall**: 0.400
  - **Soil Height to Ignore for passive pressure**: 12.00 in

### Lateral Load Applied to Stem
- **Lateral Load**: 0.0 psf
- **...Height to Top**: 0.00 ft
- **...Height to Bottom**: 0.00 ft

### Wind on Exposed Stem
- **Wind on Exposed Stem**: 10.0 psf

### Adjacent Footing Load
- **Adjacent Footing Load**: 0.0 lbs
- **Footing Width**: 0.00 ft
- **Excentricity**: 0.00 in
- **Wall to Footing Distance**: 0.00 ft
- **Footing Type**: Line Load
- **Base Above/Below Soil at Back of Wall**: 0.0 ft
- **Poisson's Ratio**: 0.300

### Stem Construction
- **Top Stem**
  - **Design Height Above Top**: 0.00 ft
  - **Wall Material Above "Ht"**: Masonry
  - **Thickness**: 6.00 in
  - **Rebar Size**: #5
  - **Rebar Spacing**: 24.00 in
  - **Rebar Placed at Center**:

### Design Data
- **fb/FB = fa/Fa**: 0.592
- **Total Force @ Section**: 96.7 lbs
- **Moment...Actual**: 467.5 ft-l
- **Moment...Allowable**: 789.5 ft-l
- **Shear...Actual**: 2.9 psi
- **Shear...Allowable**: 51.6 psi
- **Wall Weight**: 48.0 psi
- **Rebar Depth 'd'**: 2.75 in
- **Lap splice if above**: 30.00 in
- **Lap splice if below**: 6.54 in
- **Hook Embedment into footing**: 6.54 in

### Masonry Data
- **f'm**: 1,500 psi
- **Fs**: 24,000
- **Solid Grouting**: No
- **Modular Ratio "n'**: 21.48
- **Short Term Factor**: 1.33
- **Equiv. Solid Thick.**: 4.10
- **Masonry Block Type**: 3
- **Masonry Design Method**: ASD
Cantilevered Retaining Wall

Description: TYPICAL 6' CMU WALL - 9'-8" HIGH

Footings:

**Footings Design Results**

<table>
<thead>
<tr>
<th></th>
<th>Toe</th>
<th>Heel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factored Pressure</td>
<td>1,534</td>
<td>0 psf</td>
</tr>
<tr>
<td>Mu': Upward</td>
<td>563</td>
<td>0 ft-lb</td>
</tr>
<tr>
<td>Mu': Downward</td>
<td>90</td>
<td>90 ft-lb</td>
</tr>
<tr>
<td>Mu: Design</td>
<td>473</td>
<td>90 ft-lb</td>
</tr>
<tr>
<td>Actual 1-Way Shear</td>
<td>7.03</td>
<td>1.38 psi</td>
</tr>
<tr>
<td>Allow 1-Way Shear</td>
<td>75.00</td>
<td>75.00 psi</td>
</tr>
<tr>
<td>Footing Concrete Density</td>
<td>190.00pcf</td>
<td></td>
</tr>
<tr>
<td>Min. As %</td>
<td>0.0018</td>
<td></td>
</tr>
<tr>
<td>Cover @ Top</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>@ Btm. = 3.00 in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Acceptable Sizes & Spacings:

- Toe: Not req'd, Mu < S * Fr
- Heel: Not req'd, Mu < S * Fr
- Key: No key defined

Summary of Overturning & Resisting Forces & Moments

<table>
<thead>
<tr>
<th>Item</th>
<th>Force lbs</th>
<th>Distance ft</th>
<th>Moment ft-lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heel Active Pressure</td>
<td>22.5</td>
<td>0.33</td>
<td>7.5</td>
</tr>
<tr>
<td>Surcharge over Heel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toe Active Pressure</td>
<td>-15.0</td>
<td>0.33</td>
<td>-5.0</td>
</tr>
<tr>
<td>Surcharge over Toe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjacent Footing Load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load @ Stem Above Soil</td>
<td>96.7</td>
<td>5.84</td>
<td>564.2</td>
</tr>
<tr>
<td>Total</td>
<td>104.2</td>
<td>O.T.M. = 566.7</td>
<td></td>
</tr>
</tbody>
</table>

Resisting/Overturing Ratio = 1.59

Vertical Loads used for Soil Pressure = 801.7 lbs

Oil Over Heel = 0.0 lb-ft
Sloped Soil Over Heel = 0.0 lb-ft
Surcharge Over Heel = 0.0 lb-ft
Adjacent Footing Load = 0.0 lb-ft
Axial Dead Load on Stem = 0.0 lb-ft
Axial Live Load on Stem = 0.0 lb-ft
Stem Over Toe = 464.2 lb-ft
Surcharge Over Toe = 0.0 lb-ft
Stem Weight(s) = 0.0 lb-ft
Earth @ Stem Transitions = 337.5 lb-ft
Footing Weight = 370.7 lb-ft
Key Weight = 901.9 lb-ft
Vert. Component = 0.0 lb-ft

Total Overturning = 801.7 lbs, R.M. = 901.9 lbs
## Cantilevered Retaining Wall

### Description:
6" CMU WALL - 9'-8" HIGH WITH 2'-0" RETAINING

### Criteria

| Retained Height | 2.67 ft |
| Wall height above soil | 9.67 ft |
| Slope Behind Wall | 0.00 : 1 |
| Height of Soil over Toe | 8.00 in |
| Water height over heel | 0.0 ft |
| Vertical component of active | |
| Lateral soil pressure options: | |
|   NOT USED for Soil Pressure. | |
|   NOT USED for Sliding Resistance. | |
|   NOT USED for Overturning Resistance. | |

### Load Factors

- **Dead Load**: 1.200
- **Live Load**: 1.600
- **Earth, H**: 1.600
- **Wind, W**: 1.600
- **Seismic, E**: 1.000

### Soil Data

- **Allow Soil Bearing**: 1,500.0 psf
- **Equivalent Fluid Pressure Method**
- **Heel Active Pressure**: 45.0 psf/ft
- **Toe Active Pressure**: 45.0 psf/ft
- **Passive Pressure**: 100.0 psf/ft
- **Soil Density, Heel**: 110.00 pcf
- **Soil Density, Toe**: 0.00 pcf
- **Fricion Coeff btwn Ftg & Soil**: 0.400
- **Soil height to ignore for passive pressure**: 12.00 in

### Surcharge Loads

- **Surcharge Over Heel**: 0.0 psf
- **Used To Resist Sliding & Overturning**: 0.0 psf
- **Used for Sliding & Overturning**: 0.0 psf

### Axial Load Applied to Stem

- **Axial Dead Load**: 0.0 lbs
- **Axial Live Load**: 0.0 lbs
- **Axial Load Eccentricity**: 0.0 in

### Design Summary

- **Wall Stability Ratios**
  - **Overturning**: 1.86 OK
  - **Sliding**: Slab Resists All Sliding 11.95 OK
- **Total Bearing Load**: 1,421 lbs
  - **resultant ecc.**: 8.13 in
- **Soil Pressure @ Toe**: 1,359 psf OK
- **Soil Pressure @ Heel**: 0 psf OK
  - **Allowable**: 1,500 psf
- **Soil Pressure Less Than Allowable**: 0.00 psf
- **ACI Factored @ Toe**: 1,631 psf
- **ACI Factored @ Heel**: 0 psf
- **Footing Shear @ Toe**: 9.3 psi OK
- **Footing Shear @ Heel**: 5.8 psi OK
  - **Allowable**: 75.0 psi

### Sliding Calc:

- **Slab Resists All Sliding!**

- **Lateral Lading Force**: 337.3 lbs
- **less 100% Passive Force**: 0 lbs
- **less 100% Friction Force**: 0.0 lbs

- **Added Force Req'd**: 0.0 lbs OK
  - **...for 1.5 : 1 Stability**: 0.0 lbs OK

### Lateral Load Applied to Stem

- **Lateral Load**: 0.0 psf
  - **...Height to Top**: 0.00 ft
  - **...Height to Bottom**: 0.00 ft

- **Wind on Exposed Stem**: 10.0 psf

### Axial Load Eccentricity

- **Axial Live Load**: 0.0
- **Axial Dead Load**: 0.0

### Stem Construction

<table>
<thead>
<tr>
<th>Top Stem</th>
<th>Stem OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Height Above Ftg</td>
<td>0.00</td>
</tr>
<tr>
<td>Wall Material Above &quot;Ht&quot;</td>
<td>Masonry</td>
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<tr>
<td>Thickness</td>
<td>6.00</td>
</tr>
<tr>
<td>Rebar Size</td>
<td># 5</td>
</tr>
<tr>
<td>Rebar Spacing</td>
<td>16.00</td>
</tr>
<tr>
<td>Rebar Placed at</td>
<td>Center</td>
</tr>
</tbody>
</table>

### Design Data

- **f<sub>b</sub>F<sub>b</sub> + fa/Fa**: 0.963
- **Total Force @ Section**: 247.1 lbs
- **Moment...Actual**: 866.3 ft-l
- **Moment...Allowable**: 899.9 ft-l
- **Shear......Actual**: 7.5 psi
- **Shear......Allowable**: 51.6 psi
- **Wall Weight**: 52.0 psi
- **Rebar Depth 'd'**: 2.75 in
- **Lap splice if above**: 45.00 in
- **Lap splice if below**: 8.27 in
- **Hook embed into footing**: 8.27 in

### Masonry Data

- **fm**: 1,500 psi
- **Fs**: 24,000 psi
- **Solid Grouting**: No

#### Modular Ratio 'n'

- **21.48**

#### Short Term Factor

- **1.333**

#### Equiv. Solid Thick.

- **4.50**

#### Masonry Block Type

- **3**

#### Masonry Design Method

- **ASD**
Cantilevered Retaining Wall

Description: 6" CMU WALL - 9'-8" HIGH WITH 2'-0" RETAINING

**Footing Dimensions & Strengths**

- **Toe Width**: 1.00 ft
- **Heel Width**: 1.75 ft
- **Total Footing Width**: 2.75 ft
- **Footing Thickness**: 12.00 in
- **Key Width**: 0.00 in
- **Key Depth**: 0.00 in
- **Key Distance from Toe**: 0.00 ft
- **f_c** = 2,500 psi
- **f_y** = 60,000 psi
- **Footing Concrete Density**: 150.00pcf
- **Cover @ Top**: 2.00 in
- **Cover @ Btm.**: 3.00 in

**Footing Design Results**

- **Factored Pressure**: 1,631 psf
- **Mu' : Upward**: 847 ft-lb
- **Mu' : Downward**: 170 ft-lb
- **Mu: Design**: 677 ft-lb
- **Actual 1-Way Shear**: 9.25 psi
- **Allow 1-Way Shear**: 75.00 psi
- **Toe Reinforcing**: None Spec'd
- **Heel Reinforcing**: None Spec'd
- **Key Reinforcing**: None Spec'd

**Summary of Overturning & Resisting Forces & Moments**

<table>
<thead>
<tr>
<th>Item</th>
<th>Force</th>
<th>Distance</th>
<th>Moment</th>
<th>Force</th>
<th>Distance</th>
<th>Moment</th>
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<tbody>
<tr>
<td>Heel Active Pressure</td>
<td>303.1</td>
<td>1.22</td>
<td>370.7</td>
<td>367.1</td>
<td>2.13</td>
<td>780.1</td>
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<tr>
<td>Toe Active Pressure</td>
<td>-62.5</td>
<td>0.56</td>
<td>-34.7</td>
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<td>Surcharge Over Toe</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Adjacent Footing Load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added Lateral Load</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load @ Stem Above Soil</td>
<td>96.7</td>
<td>8.51</td>
<td>822.4</td>
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<tr>
<td>Total</td>
<td>337.3</td>
<td>O.T.M.</td>
<td>1,158.4</td>
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<tr>
<td>Resisting/Overturing Ratio</td>
<td>1.86</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Vertical Loads used for Soil Pressure</td>
<td>1,421.3 lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Resisting/Overturing Ratio** = 1.86

Vertical Loads used for Soil Pressure = 1,421.3 lbs

- **Soil Over Heel**
- **Sloped Soil Over Heel**
- **Surcharge Over Heel**
- **Adjacent Footing Load**
- **Axial Dead Load on Stem**
- **Axial Live Load on Stem**
- **Soil Over Toe**
- **Surcharge Over Toe**
- **Stem Weight(s)**
- **Earth @ Stem Transitions**
- **Footing Weight**
- **Key Weight**
- **Vert. Component**

Total = 1,421.3 lbs R.M. = 2,149.4

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.
Cantilevered Retaining Wall

Criteria

Retained Height = 0.00 ft
Wall height above soil = 9.67 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water pressure over heel = 0.0 ft
Vertical component of active
Lateral soil pressure options:
- NOT USED for Soil Pressure,
- NOT USED for Sliding Resistance,
- NOT USED for Overturning Resistance.

Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Design Summary

Wall Stability Ratios

Overturning = 1.74 OK
Sliding = Slab Resists All Sliding 13.51 OK

Total Bearing Load = 914 lbs
resultant ecc. = 12.50 in

Soil Pressure @ Toe = 1,329 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable

ACI Factored @ Toe = 1,595 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 4.8 psi OK
Footing Shear @ Heel = 3.3 psi OK
Allowable = 82.2 psi

Sliding Calculations

Slab Resists All Sliding!
Lateral Sliding Force = 104.2 lbs
less 100% Passive Force = 0.0 lbs
less 100% Friction Force = 368.8 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 : 1 Stability = 0.0 lbs OK

Load Factors

Dead Load = 1.200
Live Load = 1.600
Earth, H = 1.600
Wind, W = 1.600
Seismic, E = 1.000

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 30.0 psf/ft
Passive Pressure = 389.0 psf/ft
Soil Density, Heel = 110.00 pcf
Soil Density, Toe = 0.00 pcf
Friction Coeff between Fig & Soil = 0.400
Soil Height to ignore for passive pressure = 12.00 in

Calculation per ACI 318-05, ACI 530-05, IBC 2006,
CVC 2007, ASCE 7-05

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Fig CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall = 0.0 ft
Poisson’s Ratio = 0.300

Lateral Load Applied to Stem

Lateral Load = 0.0 psf
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft

Wind on Exposed Stem = 10.0 psf

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Masonry
Thickness in = 6.00
Rebar Size = # 5
Rebar Spacing in = 24.00
Rebar Placed at = Center

Design Data

ft/ FB + f/Fa = 0.992
Total Force @ Section lbs = 96.7
Moment...Actual ft-l = 467.5
Moment...Allowable ft-l = 789.5
Shear...Actual psi = 2.9
Shear...Allowable psi = 51.6
Wall Weight psf = 48.0
Rebar Depth “d” in = 2.75
Lap splice if above in = 30.00
Lap splice if below in = 6.00
Hook embed into footing in = 6.00

Masonry Data

f'm psi = 1,500
Fs psi = 24,000
Solid Grouting = No

Modular Ratio ‘n’ = 21.48
Short Term Factor = 1.333
Equiv. Solid Thick. in = 4.10
Masonry Block Type = 3
Masonry Design Method = ASD
# Cantilevered Retaining Wall

### Footing Dimensions & Strengths
- **Tie Width**: 0.42 ft
- **Heel Width**: 2.58 ft
- **Total Footing Width**: 3.00 ft
- **Footing Thickness**: 12.00 in
- **Key Width**: 0.00 in
- **Key Depth**: 0.00 in
- **Key Distance from Toe**: 0.00 ft
- **fc**: 3,000 psi
- **Fy**: 60,000 psi
- **Footing Concrete Density**: 150.00pcf
- **Min. As %**: 0.01%
- **Cover @ Top**: 2.00 in
- **@ Btm.**: 3.00 in

### Footing Design Results

<table>
<thead>
<tr>
<th></th>
<th>Toe</th>
<th>Heel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factored Pressure</td>
<td>1,595 psf</td>
<td>0 psf</td>
</tr>
<tr>
<td>Mu': Upward</td>
<td>206 ft-lb</td>
<td>0 ft-lb</td>
</tr>
<tr>
<td>Mu': Downward</td>
<td>27 ft-lb</td>
<td>438 ft-lb</td>
</tr>
<tr>
<td>Mu: Design</td>
<td>179 ft-lb</td>
<td>438 ft-lb</td>
</tr>
<tr>
<td>Actual 1-Way Shear</td>
<td>4.82 psi</td>
<td>3.28 psi</td>
</tr>
<tr>
<td>Allow 1-Way Shear</td>
<td>82.16 psi</td>
<td>82.16 psi</td>
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<tr>
<td>Toe Reinforcing</td>
<td>None Spec'd</td>
<td>None Spec'd</td>
</tr>
<tr>
<td>Heel Reinforcing</td>
<td>None Spec'd</td>
<td>None Spec'd</td>
</tr>
<tr>
<td>Key Reinforcing</td>
<td>None Spec'd</td>
<td>None Spec'd</td>
</tr>
</tbody>
</table>

Other Acceptable Sizes & Spacings:
- **Toe**: Not req'd, Mu < S * Fr
- **Heel**: Not req'd, Mu < S * Fr
- **Key**: No key defined

## Summary of Overturning & Resisting Forces & Moments

<table>
<thead>
<tr>
<th>Item</th>
<th>Force</th>
<th>Distance</th>
<th>Moment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heel Active Pressure</td>
<td>22.5</td>
<td>0.33</td>
<td>7.5</td>
</tr>
<tr>
<td>Surcharge over Heel</td>
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<td></td>
</tr>
<tr>
<td>Toe Active Pressure</td>
<td>-15.0</td>
<td>0.33</td>
<td>-5.0</td>
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<tr>
<td>Surcharge over Toe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjacent Footing Load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added Lateral Load</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load @ Stem Above Soil</td>
<td>96.7</td>
<td>5.84</td>
<td>564.2</td>
</tr>
</tbody>
</table>

**Total** = 104.2 O.T.M. = 566.7

**Resisting/Overturning Ratio** = 1.74

**Vertical Loads used for Soil Pressure** = 914.2 lbs

**Overturning Moment** = 566.7

**Resisting Moment** = 914.2 lbs

**Total** = 986.0 lbs

*Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.*
**Masonry Lintel**

**Lic. #**: KW-08003193  
**Licensee**: TURNER STRUCTURAL ENGINEERS

**Description**: TYPICAL MASONRY LINTEL

**Code References**
Calculations per ACI 530-05, IBC 2006, CBC 2007, ASCE 7-05

**Load Combinations Used**: ASCE 7-02

### General Information
- **f'c**: 1500.0 psi
- **f's**: 24,000.0 psi
- **Em = f'c * 900.0**
- **Wall Wt Multi**: 1.0
- **Block Type**: Normal Wt
- **Lateral Wind Load**: 10.0 psf
- **Lateral Wall Weight Seismic Factor**: 0.330
- **Rebar Size**: 4.0
- **# Bars E/F**: 2
- **Top Clear**: 6.0 in
- **Btm Clear**: 6.0 in
- **E**: 1.350 ksi
- **n**: 21.481

### Uniform Loads

<table>
<thead>
<tr>
<th>Start X</th>
<th>End X</th>
<th>Dead Load</th>
<th>L: Floor Live</th>
<th>Lr: Roof Live</th>
<th>S: Snow</th>
<th>W: Wind</th>
<th>E: Earthquake</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>ft</td>
<td>ft</td>
<td>0.1360</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>#2</td>
<td>ft</td>
<td>ft</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>#3</td>
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<td>ft</td>
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</tr>
<tr>
<td>#4</td>
<td>ft</td>
<td>ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Maximum Stress Ratios
- **f_b/F_b**: 0.06810
- **f_v/F_v**: 0.1410

### Maximum Moment
- **Actual**: 0.3442 k-ft
- **Allowable**: 5.056 k-ft

### Minimum Mn = 1.3 * Fcr * S =
- 1.950 k-ft

### Vertical Strength
- **As**
- **rho**
- **np**
- **k**: (np)^2 + 2np)^.5 - np
- **M:mas = Fb x j x b^2 x 2/2**
- **M:Stl = Fs x As x j d**

### Lateral Strength
- **As**
- **rho**
- **np**
- **n**
- **k**: (np)^2 + 2np)^.5 - np
- **M:mas = Fb x j x b^2 x 2/2**
- **M:Stl = Fs x As x j d**
### Masonry Lintel

**Lic. #: KW-05003193**

**Description:** TYPICAL MASONRY LINTEL

**Licensee:** TURNER STRUCTURAL ENGINEERS

#### Detailed Load Combination Results

<table>
<thead>
<tr>
<th>Load Combination</th>
<th>Vertical</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mmax k-ft</td>
<td>Mallow k-ft</td>
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<tr>
<td>D Only</td>
<td>0.34</td>
<td>5.06</td>
</tr>
<tr>
<td>+D+L+H</td>
<td>0.34</td>
<td>5.06</td>
</tr>
<tr>
<td>+D+Lr+H</td>
<td>0.34</td>
<td>5.06</td>
</tr>
<tr>
<td>+D+S+H</td>
<td>0.34</td>
<td>5.06</td>
</tr>
<tr>
<td>+D+0.750Lr+0.750L+H</td>
<td>0.34</td>
<td>5.06</td>
</tr>
<tr>
<td>+D+0.750L+0.750S+H</td>
<td>0.34</td>
<td>5.06</td>
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<tr>
<td>+D+W+H</td>
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<td>5.06</td>
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<td>5.06</td>
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<tr>
<td>+D+0.750L+0.750S-0.750W+H</td>
<td>0.34</td>
<td>5.06</td>
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<tr>
<td>+D+0.750L-0.750S-0.750W+H</td>
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<tr>
<td>+D+0.750L+0.750S+0.5250E+H</td>
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<td>5.06</td>
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<tr>
<td>+D+0.750L+0.750S+0.5250E+H</td>
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<td>5.06</td>
</tr>
<tr>
<td>+0.60D+W+H</td>
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<td>+0.60D-1.0W+H</td>
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<td>5.06</td>
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<tr>
<td>+0.60D+0.70E+H</td>
<td>0.21</td>
<td>5.06</td>
</tr>
<tr>
<td>+0.60D-0.70E+H</td>
<td>0.21</td>
<td>5.06</td>
</tr>
</tbody>
</table>
SECTION THREE
BID FORM
West Campus Men’s Gym Locker Area Remodel

Date ______________________________

Bid of ____________________________________________,
(Name)
a corporation organized and existing under the laws of the State of _______________________; a partnership consisting of _______________________________________; an individual trading as _____________________________________________.
(Name)

PROJECT: ______________________________________

TO: Pima County Community College District, hereinafter called the “Owner”

1. In compliance with your Notice Inviting Sealed Bids and Instructions to Bidders, the undersigned hereby offers to furnish the materials and perform the work for the Owner's Project designated above, in strict accordance with the Specifications, Schedules, Drawings, and all other pertinent Contract Documents, and agrees, upon written notice of acceptance of this Bid at any time within forty-five (45) days after the date of opening of the bids, that he will execute the Contract in accordance with the Bid as accepted, and give bond, as sufficient surety, in the amount of one hundred percent (100%) of the Contract Amount, within five (5) days after the Contract Documents are presented for signature, for the following sums:

Base Bid - ____________________________________________ ($__________________).

Alternate No. 1 (Add)(Deduct) - ____________________________________________ ($__________________).

Alternate No. 2 (Add)(Deduct) - ____________________________________________ ($__________________).

Alternate No. 3 (Add)(Deduct) - ____________________________________________ ($__________________).

Alternate No. 4 (Add)(Deduct) - ____________________________________________ ($__________________).

Alternate No. 5 (Add)(Deduct) - ____________________________________________ ($__________________).
2. Enclosed is bid security as required consisting of ________________________ in the amount of _________________________________________________ ($_____________). (Not less than ten percent (10%) of the proposed Contract Amount, including all additive alternates.)

3. It is understood and agreed that the work under the Contract Documents shall be commenced by the undersigned Bidder, if awarded the Contract for the Project, on the date specified as the Start Date in the Notice to Proceed issued by the Owner in the manner specified in the Contract and General Conditions, and shall be completed by the Contractor within ______________________ (____) consecutive calendar days. If the work is not completed by that date, the undersigned Bidder shall pay Owner the amount of Five Hundred Dollars ($500.00) as liquidated damages for each calendar day after expiration of the Contract Time that the work remains incomplete. An Early Completion Bonus shall be paid to the Contractor at the rate of Five Hundred Dollars ($500.00) per calendar day the work is Substantially Complete in advance of the expiration of the Contract time up to a maximum of Ten Thousand Dollars ($10,000.00). For purposes of the Early Completion Bonus, the Contract Time(s) shall not be extended or changed for any reason.

4. The undersigned Bidder hereby acknowledges receipt of the following Addenda, if any:

   Addendum No.    Date
   ______________________ _____________________

5. The undersigned Bidder understands that the Owner reserves the right to reject any or all Bids or to waive any formality or technicality, and to accept Alternates in any order or combination, and to determine the low bidder on the basis of the sum of the Base Bid and the Alternates selected, as determined by the Owner in its sole discretion, in any Bid in the interest of the Owner.

6. The undersigned Bidder hereby certifies and affirms that this Bid is genuine and not a sham or collusive, nor made in the interest or behalf of any person not herein named, and that the undersigned Bidder has not directly or indirectly induced or solicited any other Bidder to put in a sham bid, or any other person, firm, or corporation to refrain from bidding, and that the Bidder has not in any manner sought by collusion to secure for itself an advantage over any other Bidder.

7. The undersigned Bidder hereby discloses the name of any officer, director or agent who is also an employee of the College or any of its agencies. Further, that it has disclosed the name of any College employee who owns, directly or indirectly, an interest in the vendor or any of its branches. (Attach List)

8. Contractor's Arizona Contractor's License No(s). _________________________.

   (Official Name of Firm)

   SEAL - If Bidder is a Corporation

   By ______________________
   Title ______________________

   (Complete Business Address)
SECTION FOUR
LIST OF SUBCONTRACTORS
(To be filled out and submitted in separate sealed envelopes as a part of the Bid.)

OWNER’S PROJECT:    West Campus Men’s Gym Locker Area Remodel

In compliance with Paragraph 2 of the Instructions to Bidders, the undersigned submits the following names of Subcontractors to be used in performing the work for the Project.

Contractor must indicate any changes in the subcontractor list that would result from acceptance by the Owner of any combination of alternates by identifying the substitute Subcontractor to be used, along with the number of the alternate that would result in such substitution. No substitutions or deviations from this list shall be permitted without written consent of the Owner. If required, the Contractor shall supply each subcontractor’s License Type and Number to the owner within 24 hours of such request.

<table>
<thead>
<tr>
<th>SUBCONTRACTORS OR MATERIAL VENDOR’S WORK</th>
<th>SUBCONTRACTOR’S NAME</th>
<th>LICENCE NUMBER AND TYPE (TO BE SUPPLIED WITHIN 24 HOURS IF REQUESTED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation – Grading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td></td>
<td></td>
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<td>Fire Alarm System</td>
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**SUBMITTED BY:**

____________________________
Contractor

By____________________________
Title____________________________
Date____________________________
SECTION FIVE

FORMS ATTACHED

• BID BOND
• PAYMENT BOND
• PERFORMANCE BOND
• BIDDER’S INFORMATION
• CONTRACTOR’S AFFIDAVIT OF RELEASE OF LIENS
• FEDERAL DEBARRED LIST CERTIFICATION
• AFFIDAVIT OF NON COLLUSION
BID BOND

PURSUANT TO NOTICE INVITING SEALED BIDS
(Value of this bond must be not less than 10% of the bid amount)

KNOW ALL PERSONS BY THESE PRESENTS:

THAT, __________________________________________ (hereinafter called the "Principal"), as Principal, and __________________________________________, a corporation organized and existing under the laws of the State of ____________, with its principal office in the City of ____________ (hereinafter called the Surety"), as Surety, are held and firmly bound unto Pima County Community College District (hereinafter called the ("Obligee") in the amount of ________________________ Dollars ($_____________), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of the bid and give the bonds and certificates of insurance as specified in the standard specifications with good and sufficient surety for the faithful performance of the contract and for the prompt payment of labor and materials furnished in the prosecution of the contract, or in the event of the failure of the Principal to enter into the contract and give the bonds and certificates of insurance, if the Principal pays the Obligee the difference not to exceed the penalty of the bond between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by the bid, then this obligation is void. Otherwise, it remains in full force and effect; provided, however, that this bond is executed pursuant to the provisions of Ariz. Admin. Code Rule R7-2-1111, and all liabilities on this bond shall be determined in accordance with the provisions of the section to the extent as if it were copied at length herein.

The prevailing party in a suit on this bond shall recover as a part of his judgment such reasonable attorneys' fees as may be fixed by a judge of the Court.  

Witness our hands this ____ day of _________________, 201__.

__________________________  By_________________________________
PRINCIPAL         Seal

__________________________  ________________________________________
AGENCY OF RECORD     Title____________________________

________________________________
Agency Address    SURETY      Seal

__________________________  By_________________________________
PRINCIPAL         Seal

Agency Address    SURETY
PAYMENT BOND

(Value of this bond must be 100% of the Contract Amount)

KNOW ALL PERSONS BY THESE PRESENTS:

That, _________________________________________________ (hereinafter called the “Principal”), as Principal, and __________________________________, a corporation organized and existing under the laws of the State of ____________, with its principal office in the City of ________________ (hereinafter called the “Surety”), as Surety, are held and firmly bound unto Pima County Community College District, Pima County, Arizona (hereinafter called the “Obligee”), for the amount of ________________________________ Dollars ($____________________) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, entitled Contract and General Conditions Between Owner and Contractor, dated the ____ day of ________________, 201__, (“Contract”), to construct and complete certain work described as __________________________________________, which Contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, the condition of this obligation is such that if the Principal promptly pays all monies due to all persons supplying labor or materials to the Principal or the Principal’s subcontractors in the prosecution of the work provided for in the Contract, this obligation is void. Otherwise it remains in full force and effect.

Provided, however, that this bond is executed pursuant to the provisions of Arizona Administrative Code Rule R7-2-1112, and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of said Rule, to the extent as if it were copied at length in this agreement.

The prevailing party in a suit on this bond shall recover as part of the judgment reasonable attorney fees that may be fixed by a judge of the Court.

Witness our hands this ____ day of ________________, 201__.

_______________________________________
PRINCIPAL Seal

__________________________  By_________________________________
AGENCY OF RECORD     Title____________________________

____________________________________
Agency Address

__________________________  ________________________________________
SURETY Seal

By_________________________________
Title____________________________
PERFORMANCE BOND

(Value of this bond must be 100% of the Contract Amount)

KNOW ALL PERSONS BY THESE PRESENTS:

That, ___________________________________________ (hereinafter called the "Principal"), as Principal, and ______________________________, a corporation organized and existing under the laws of the State of ________________, with its principal office in the City of ________________ (hereinafter called the "Surety"), as Surety, are held and firmly bound unto Pima County Community College District, Pima County, Arizona (hereinafter called the "Obligee"), for the amount of ____________________ Dollars ($____________________) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, entitled Contract and General Conditions Between Owner and Contractor, dated the ____ day of ________________, 201___ ("Contract"), to construct and complete certain work described as __________________________________________, which Contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, the condition of this obligation is such that if the Principal faithfully performs and fulfills all of the undertakings, covenants, terms, conditions and agreements of the Contract during the original term of the Contract and any extension of the Contract, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and also performs and fulfills all of the undertakings, covenants, terms, conditions and agreements of all duly authorized modifications of the Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, the above obligation is void. Otherwise, it remains in full force and effect.

The prevailing party in a suit on this bond shall recover as part of the judgment reasonable attorney fees that may be fixed by a judge of the Court.

Witness our hands this ____ day of _________________, 201__.
BIDDER'S INFORMATION

Bidder shall state if this Proposal is submitted by an Individual, Partnership, or Corporation.

________________________________________________________________

1. IF PARTNERSHIP, list names of all partners:

________________________________________________________________

________________________________________________________________

2. IF CORPORATION, give name of State in which corporation is registered:

________________________________________________________________

Provide the names of the following Corporation officers:

President ______________________________________________

Secretary ______________________________________________

Treasurer ______________________________________________

3. If LICENSED CONTRACTOR, provide all contractor's license number(s) applicable to this Proposal:

_______________________________  __________________________

_______________________________  __________________________

_______________________________  __________________________

_______________________________  __________________________

4. Provide name of bonding company: ________________________________

Total bonding capacity: $_______________________

5. Name of Firm_____________________________________________________

6. Telephone: __________________ Fax: _____________________________
TO
Pima County Community College District
District Purchasing Services
4905D East Broadway, Room 113
Tucson, Arizona 85709-1420

PROJECT:
(Name, Address)

State of:
County of:

The undersigned, pursuant to Article _______ of the General Conditions of the Contract for Construction, hereby certifies that to the best of his knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS: (If none, write "None")

ATTACHMENTS
1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

CONTRACTOR:

Address:

By:

Subscribed and Sworn to before me on this ______ day of __________ 201__.

Notary Public:

My Commission expires: ____ / ____ / ____

(Signature)

If by a Corporation:
(Seal)
FEDERAL DEBARRED LIST CERTIFICATION

Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters (Dec 2001)

___________________
(Date)

District Finance Office – Purchasing
Pima Community College
4905 E Broadway Blvd.
Tucson, AZ 85709

In accordance with the Federal Acquisition Regulation, 52-209-5:

(a) (1) The Offeror certifies, to the best of its knowledge and belief, that-

(i) The Offeror and/or any of its Principals-

(A) (check one) Are ( ) or are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency; (The debarred list (List of Parties Excluded from Federal Procurement and Nonprocurement Programs) is at http://epls.arnet.gov on the Web)

(B) (check one) Have ( ) or have not ( ), within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract, violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion; or receiving stolen property; and

(C) (check one) Are ( ) or are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) The Offeror (check one) has ( ) or has not ( ), within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) “Principals”, for the purposes of this certification, means officers; directors’ owners’ partners’ and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager, head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.
(a) The Offeror shall provide immediate written notice to the Contracting Officer, if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(b) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(c) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(d) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(Firm) __________________________  (Mailing Address) _____________________________________

(email address) ___________________ (Phone) _______________________

(Signature) ______________________ (Fax) _________________________

(Print Name) ______________________ (Federal Taxpayer ID Number) _______________________

(Print Title)
AFFIDAVIT BY CONTRACTOR
CERTIFYING THAT THERE WAS NO
COLLUSION IN BIDDING
FOR CONTRACT

STATE OF:  
COUNTY OF:  

(Name of Individual)
being first duly sworn upon oath deposes and says:
That he is (Title)
of (Name of Company, Firm, or Corporation)
that, pursuant to Subsection 112(c) of Title 23, United States Code and Title 44, Chapter 10, Article 1, and Title 34, Chapter 2, Article 4 of the Arizona Revised Statutes, he certifies that neither he nor anyone associated with the company, firm, or corporation mentioned above has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of full competitive bidding in connection with the associated project:

Subscribed and sworn to before me this ______ day of _________ 201__.  (Signature)

My commission expires: __________  
(Seal)

Notary Public